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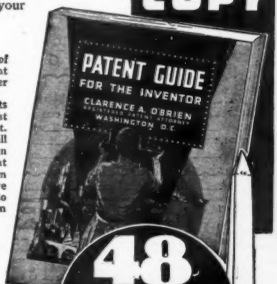

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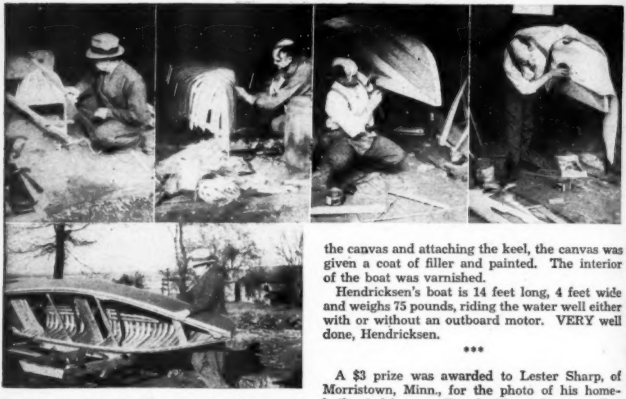

Sent in by Russell V. Hendriksen, the series of photographs above show how he constructed his 14-foot boat. The completed craft weighs 75 pounds and is easily transported on a trailer. A description of the construction process appears in text.

A PHOTO of a completed project is always interesting to home workshop fans, but a series of photos showing the step-by-step construction of a project is doubly interesting. Therefore, this month's Workbench prize of $5 has been awarded to Russell V. Hendriksen, of St. Paul, Minn., who sent in the photographs above. Running from left to right, the upper photos show (a) building the frame (b) bending ribs around the frame (c) planking (d) covering hull with canvas (e) loading the completed boat on a trailer (lower photo).

Describing the construction process, Hendricksen's letter states that the ribs were easily bent to the desired shape by wrapping them in burlap bags and then pouring hot water over the bags to make the wood pliable. The ribs were then covered with lightweight basswood planks, held to the ribs by cleated copper nails. The hull was then covered with heavy canvas duck, which was pulled and worked into shape. After trimming the canvas and attaching the keel, the canvas was given a coat of filler and painted. The interior of the boat was varnished.

Hendricksen's boat is 14 feet long, 4 feet wide and weighs 75 pounds, riding the water well either with or without an outboard motor. VERY well done, Hendricksen.

***

A $3 prize was awarded to Lester Sharp, of Morristown, Minn., for the photo of his home-built windcharger. Fitted with a 6-foot propeller, which is governed to rotate at a maximum speed of 1,000 r.p.m., the windcharger operates a generator that charges up to three batteries at a time. Good work, Lester.

***

A photo of his home-built outboard runabout won a $3 award for Tom Yaxley, of Detroit, Mich. Featuring spruce frames and planking, the boat is 9 feet, 8 inches long with a beam of 43 inches.

[*Continued on opposite page*]

Tom Yaxley built this trim-looking outboard runabout. Powered by a 9-horsepower motor it skips over the waves at 35 m.p.h.

Editor's Workbench Chips

[*Continued from opposite page*]

Capable of charging three batteries at a time, this sturdy wind-charger was built by Lester Sharp, It features a 6-foot propeller.

The decking is made of Philippine mahogany and the cockpit is trimmed with red leather upholstery. A metal drip pan collects any oil or gasoline that drops from the 9 horsepower outboard motor which drives the craft over the waves at speeds up to 35 m.p.h. You certainly turned out a first class job, Tom.

***

From far away Australia came a letter and photo which won a $3 prize for R. L. McCann, Jr., who built the midget racer shown below. Capable of speeding along at 30 m.p.h., the car has a three-speed transmission, foot clutch, foot brake and a "kick" starter. It travels about 60

[*Continued on page 12*]

Midget racers are popular in Australia, too, as this photo, sent in by R. L. McCann, proves. Fitted with a 3-speed transmission, the little car travels the highways at a speed of 30 m.p.h.

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Washington, D. C.

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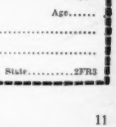

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National Radio Institute
Dept. 9GH, Washington, D. C.

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JUNE ISSUE for MEN

• 25¢ •

NOW ON SALE AT ALL NEWSSTANDS

Editor's Workbench Chips

[*Continued from page 11*]

Costing only $7 for materials, this kyack was built by Boyd Ellsworth. A two-bladed paddle enables him to make good speed.

miles on a gallon of fuel. Looks like a well-built job, McCann.

***

Another MI boat builder who scored a $3 prize is Boyd Ellsworth, of New Boston, Ill., who built a kyack from plans that appeared in the August, 1938 issue of MI. Judging from the photo above, he did a first rate job and I can readily believe his claim that the two-bladed paddle enables him to skim over the water at a good speed. Total cost of constructing the simple craft was only $7, according to Boyd. Nice work!

***

The hobby of flying model airplanes powered by miniature gasoline engines continues to attract new enthusiasts. A photo of the "putt-putter" he constructed won a $3 prize for Victor Lydon, of St. Paul, Minn., not only because the model shows excellent craftsmanship, but because he fitted it with a tiny camera which automatically takes photos as the plane travels through the sky. A very novel and interesting idea, Victor. Why not let us see one of the pictures taken by the plane?

[*Continued on opposite page*]

Powered by a miniature gasoline engine of ½-horsepower, this model plane was built by Victor Lydon. It is equipped with a tiny camera that takes photographs while model is in flight.

Editor's Workbench Chips

[*Continued from opposite page*]

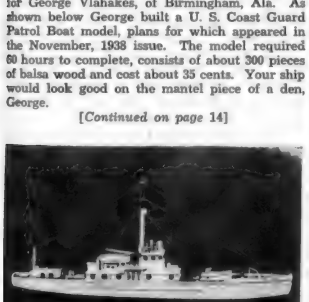
Nelson H. Schmidt proudly poses with the model cabin cruiser he constructed. It is powered by an old auto fan motor and attains a speed of 5 m.p.h. All fittings were hand-made.

A photo of the model powered cruiser he constructed earned a $3 prize for Nelson H. Schmidt, of St. Louis, Mo. Powered by an auto fan motor operated by a series of batteries, the 48-inch boat travels through the water at a speed of 5 m.p.h. The hull, cabin, decks, etc., are made of sheet balsa of a 1/16-inch thickness. All details such an anchor, chain, lifeboat, funnel ventilators, etc., are hand-made. You rate a pat on the back for your craftsmanship, Nelson.

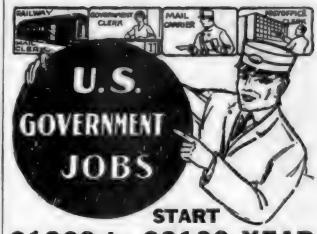
***

A photo of a model boat also won a $3 prize for George Vlahakes, of Birmingham, Ala. As shown below George built a U. S. Coast Guard Patrol Boat model, plans for which appeared in the November, 1938 issue. The model required 60 hours to complete, consists of about 300 pieces of balsa wood and cost about 35 cents. Your ship would look good on the mantel piece of a den, George.

[*Continued on page* 14]



Following plans that appeared in the November 1938 issue, George Vlahakes constructed this model of a U. S. Coast Guard Patrol Boat. It is comprised of 300 pieces of balsa wood and cost 35 cents.



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Editor's Workbench Chips

[*Continued from page 13*]

No more pedaling for Arthur P. Stone, who built a two-cycle motor and mounted it within the frame of his bicycle, as shown here. Engine speed is controlled by a throttle on handle bar.

Certain to interest every bicycle owner is the photo sent in by Arthur P. Stone, of Akron, Ohio, showing how he powered his bike with a motor mounted within the frame. The motor is a two-cycle type which he constructed himself. The tank and rear wheel are from an old Johnson motor-wheel, a sprocket chain connecting the wheel to a pully driven by a belt that contacts the flywheel of the motor. Engine speed is controlled by a hand throttle. Okay, Arthur, I'm sending you MI's check for $3 in the next mail.

***

Photo fan Everett A. Dumas scored a $3 prize by sending in a picture of his home-built revolving filter turret, shown below. Following plans that appeared in the January, 1938 issue of MI, Dumas constructed the turret in a few hours. Scrap materials were used with the exception of the sun shade, which was made from an aluminum funnel purchased for a few cents. Great stuff, Dumas!

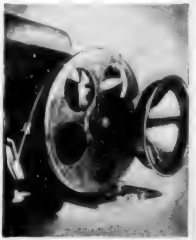

Photo fan Everett A. Dumas assembled this revolving filter turret. The sun shade was made from an aluminum funnel.

***

Using an old bicycle frame and a gasoline type washing machine engine Fred A. Marshall, of

[*Continued on opposite page*]

Editor's Workbench Chips

[*Continued from opposite page*]

An old bicycle frame plus a gasoline-type washing machine engine enabled Fred A. Marshall to build this powered bike. Plans for a somewhat similar project will appear in the September MI.

Chapel Hill, Tenn., constructed the powered scooter shown above. The chassis base is made of lumber and the fenders were cut from a metal sign. Mileage of 120 miles per gallon of fuel and a top speed of 30 m.p.h. are claimed. Watch for MI's check for $3 in the mail, Fred. (Note to readers—plans for building a powered bike of this type will appear in the September issue).

***

Midget racers must certainly be rated as one of the most popular projects with home craftsmen, judging from the numerous photos sent to the Workbench. Shown below is the racer constructed by George Egley, of Rock Island, Ill. It is powered by a gasoline-type washing machine motor and travels at a speed of 10 m.p.h., which makes it safe for Egley's 7-year-old son to operate. A single lever controls the clutch and brake, releasing one while applying the other. Accept my compliments for turning out such a nice car, Egley. MI's check for $3 is on the way.

[*Continued on page* 16]

This midget racing car was built by George Egley for his son, Johnny. It is powered by a washing machine motor and has a single lever that controls the clutch and brake.

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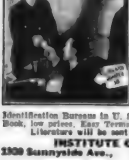

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Editor's Workbench Chips

[*Continued from page 15*]

A photo of one of the best sailboat models I have seen in quite some time won a $3 prize for Paul Mrasco, of Bridgeport, Conn. The model is 30 inches long and stands 40 inches high from deck to top of mast. The mainsail has an area of 407 square inches and the jib, 87 square inches. All fittings such as slides and tracks for mast and boom, are hand-made. Your craftsmanship rates A-1 with me, Paul.

This excellent sailboat model was built by Paul Mrasco. It is 30 inches long and has a 40-inch mast (deck to top). All fittings were hand-made.

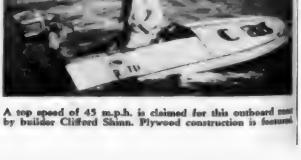
•••

A $3 prize was awarded to Clifford Shinn, of Venice, Calif., who sent in a photo of his home-built outboard speedboat, shown below. The craft features plywood construction and its lightweight two-cylinder motor enables it to zoom over the water at a speed of 45 m.p.h. I bet you think you are flying when you hit that speed, Cliff.

•••

Being confined to bed certainly has not impaired the craftsmanship of E. E. Steuckert, of Cannon Falls, Minn., judging from the photo of

[*Continued on opposite page*]



A top speed of 45 m.p.h. is claimed for this outboard made by builder Clifford Shinn. Plywood construction is featured.

Editor's Workbench Chips

[*Continued from opposite page*]

Despite the handicap of being confined to bed, this excellent model of a gull-wing Stinson airplane was constructed by E. E. Sieukert in six months. It has movable controls and doors.

the model plane he built. Using a bed table as his workbench, he constructed the 33-inch gull-wing Stinson model in six months. It features movable controls, doors that open and the cabin is fitted with four chairs. You've turned out a swell model despite your handicap, Sieuckert, and I am really pleased to be able to award you the $3 prize. A check is on its way.

***

Another photography fan who scored a $3 prize is Dick Irving, of Dunnville, Canada, who is shown adjusting the enlarger he constructed from plans that appeared in the March, 1938 issue. Like other MI readers, Dick says that our photography articles are "tops" and hopes we will continue to feature them. As the saying goes, Dick—"you ain't seen nuthin yet." Keep your eyes on future issues and don't forget the PHOTOGRAPHY HANDBOOK and GOOD PHOTOGRAPHY books which are published by the publisher of MI. You'll find them on your newsstand or they can be ordered direct from MI's office in Greenwich, Conn., for 30 cents. They are chock full of interesting ideas on your hobby.

Dick Irving is shown adjusting the enlarger he built from plans that appeared in MI for March, 1938.

[*Continued on page* 18]

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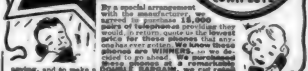

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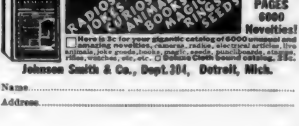

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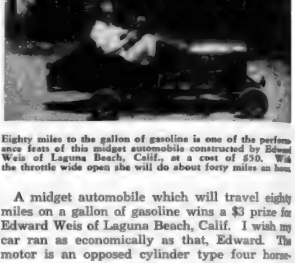
Editor's Workbench Chip

[*Continued from page 17*]



Eighty miles to the gallon of gasoline is one of the performance feats of this midget automobile constructed by Edward Weis of Laguna Beach, Calif., at a cost of $50. With the throttle wide open she will do about forty miles an hour.

A midget automobile which will travel eighty miles on a gallon of gasoline wins a $3 prize for Edward Weis of Laguna Beach, Calif. I wish my car ran as economically as that, Edward. The motor is an opposed cylinder type four horsepower motorcycle engine and drives one rear wheel through a three-speed motorcycle transmission. Old auto parts make up the steering gear and front axle. The car has a top speed of forty miles per hour. It cost about $50 to build.

* * *

A small portable paint spraying machine, built by Paul Schirmer of Egg Harbor City, N. J., looked good enough to us to carry off an award of $3 for Paul. The motor which operates the sprayer came from an old washing machine. The compressor formerly was part of an automobile. The only parts that Paul had to purchase were the sprayer, the air regulator and the safety valve. The entire cost of the outfit was $15, including spray gun and regulator. When not being used to spray paint, the machine will inflate tires, Paul says, which makes it a mighty handy thing to have around the house. The young lady who is demonstrating

The young lady is about to demonstrate a small portable paint sprayer constructed by Paul Schirmer of Egg Harbor City, N. J.

[*Continued on opposite page*]

Editor's Workbench Chips

[*Continued from opposite page*]

Louis De Vorsey is the proud driver of this midget racer which his dad built for him. Motor is mounted under a hood at the rear.

Paul's sprayer seems mighty happy about something. Maybe she knew all along that Paul would win an award.

***

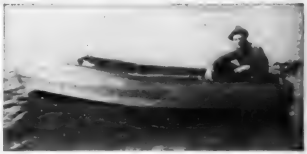
A photo of the midget racing car built for him by his dad won a $3 award for Louis De Vorsey, of Lyndhurst, N. J. He claims the tiny car will travel at a speed of 30 m.p.h., but that his father has put a governor on the motor so that he can't "hit it up." The motor is under the tail compartment, but Louis failed to state what power it has, whether it is a washing machine motor or a motorcycle engine. My guess is that the rear mounting indicates a converted washing machine motor. Am I right, Louis?

***

Bernard Etra, who was given credit in the May Workbench for building a midget auto, has asked me to point out that the car was really built by Julius Merl, of 1923 Walton Ave., New York, N. Y. Okay, Bernard, I'm glad you sent in the correction as I always like to give the right craftsman credit for his projects. You say you gave him MI's check, so that fixes the matter still better.

***

We have received quite a few letters recently from Workshop builders who say they are not photographers and want to know if drawn plans of their projects cannot be substituted for photographs. We are sorry but we must have photos. The reason is that photos are the only method of giving a clear likeness of the finished project. Drawings and blueprints may be faithful to detail but they never can give quite the picture that a photograph can give. This, however, should not discourage those who are not photographers, because there is hardly anyone who hasn't some friend who has a camera. It ought to be a simple matter to go to such a friend and ask him to snap a picture of the completed project to send to MI.



Joe Hicks constructed this boat from plans which appeared in MI. It is twelve feet long, has a beam of four feet and is powered with a 1.5 horsepower outboard engine. It will travel about eight miles per hour.

***

Joe M. Hicks of Fort William, Ontario, takes a prize of $3 for the boat he and his father built from plans in MECHANIX ILLUSTRATED. The craft is twelve feet long, has a beam of four feet and a depth of fifteen inches. It draws about an inch

[*Continued on page* 20]

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Editor's Workbench Chips

[Continued from page 19]

This twin engine biplane, something unusual in gasoline models, is the work of Wayne A. Schindler of St. Paul, Minnesota.

of water when not loaded too heavily. It is powered with a 1.5 horsepower outboard engine which drives it along at rate of eight miles an hour.

•••

A model airplane with twin gasoline engines is a bit on the unusual side, so for this neat job I am sending a $3 prize to Wayne A. Schindler of St. Paul, Minn. Wayne tells us the ship cracked up soon after the pictures were taken, which is mighty tough luck.

•••

A scooter which will travel at a speed of thirty miles an hour captured a $3 award for Jay Wallace, thirteen years old, of Sterling, Ill. A gasoline engine generating three-quarters of a horsepower furnishes the motive power for Jay's machine, which was built at a total cost of $25.

Jay Wallace, thirteen years old, built this power scooter which can attain a speed of thirty miles an hour.

[Continued on opposite page]

Editor's Workbench Chips

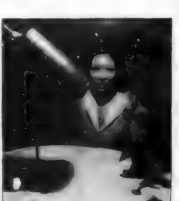
[*Continued from opposite page*]

This model plane was built by Bob Spiece of Owasso, Mich., from MI plans. The ship's name is Miss Los Angeles.

Following plans and specifications in MI, Bob Spiece, of Owasso, Mich., built a model airplane which gained a $3 prize for him. The ship, which Bob christened "Miss Los Angeles," captured first prize in a model exhibit in his home town.

***

Another project built from MI plans is the spotlight of L. E. Leuthold of Indianapolis, Ind., which dropped a $3 prize into his lap. The total cost of the light was $2.78, including a 4½-inch condensing lens which cost $1.20. It uses a number 2 photoflood bulb. Mrs. Leuthold aided her husband to win his award by manipulating the light while he snapped the picture.



Mrs. L. E. Leuthold sits in the glow of the spotlight her husband constructed from a set of plans in MI.

***

Stewart Young and James Ogden, of Hazel Park, Mich., sent in pictures of the "Imp," the little

[*Continued on page 22*]

It's Ready Now!

Readers of previous issues of PHOTOGRAPHY HANDBOOK will welcome the announcement that the newest edition, No. 3, is now available at newsstands, camera stores or by mail directly from the publishers.

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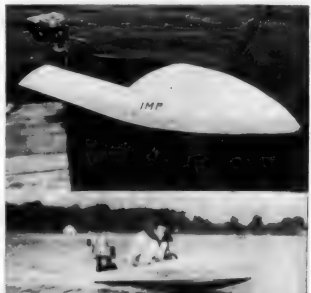
Editor's Workbench Chips

[*Continued from page 21*]



The "Imp," built by Stewart Young and James Odgen, weighs only 35 pounds, is powered with 9.2 horsepower engine and will do forty miles an hour.

speedboat which they built from MI plans, and so won a $3 award. The "Imp" is driven by a 9.2 horsepower outboard motor, will do forty miles an hour and weighs only fifty-five pounds.

***

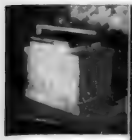
Arvid Johnson, of Chicago, gets a $3 prize for "Shorty," the little car he built from an old Model T Ford. Arvid, who is an auto mechanic by trade, used MI plans with a few modifications of his own. "Shorty" gives him lots of laughs, he says.

[*Continued on opposite page*]

Arvid Johnson built this little car, which he calls "Shorty," from an old Model T Ford. It has a wheelbase of just 52 inches.

Editor's Workbench Chips

[*Continued from opposite page*]



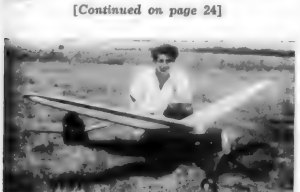
The picture above shows an automatic photo printer constructed by Robert O. Bement of Wakeman, O. At the right is an enlarger made by him at a cost of $2.55.

A $3 prize goes to Robert O. Bement of Wakeman, Ohio, for pictures of his photo enlarger and printer. The enlarger was built from MI plans and cost only $2.55. Robert made more than this amount the first week he did business with the enlarger. It gets results that compare favorably with costly commercially built models, he says.

***

To Larry Eisinger of New York City goes a $3 award for his gasoline model plane which he calls "Altitudy." The little ship has a ten-foot wing spread and is powered with a one-third horsepower engine. Larry claims many advantageous features for his model, including a cantilever landing gear with internal shock absorbers and a dihedral tail. His inverted motor, which swings an eighteen-inch prop, uses a special fuel that nearly doubles its power, he says. But don't ask him to tell you the formula for that fuel. It's his secret.

[*Continued on page 24*]



"Altitudy" is the name of this ten-foot model plane powered with a one-third horsepower engine. Larry Eisinger of New York City is the designer and builder.

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Editor's Workbench Chips

[*Continued from page 23*]

The Editor Is Told

WE HAVE received bushels of letters in response to our guaranty of satisfaction or double your money back, which was announced in the May issue of MI. Most of the writers, instead of taking a rap at us, were high in their praise of the magazine. A surprisingly small number, we were pleased to note, asked for a return of their money plus the extra dime.

Due to the heavy amount of mail, we have decided to publish excerpts from a few of the letters which criticize MI constructively or otherwise. In each case we will endeavor to reply to the criticism. So if you have anything to get off your chest, let's have it. If we think it would be of interest to other readers, we will print the "meat" of it in the Editor's Workbench Chips section for all to see.

Here we go on the first batch of mail!

Dear Sir:

I am not writing to have you refund double the money I paid for the magazine, but to complain about the articles by Al Williams. Mr. Williams, being an American, should plug American aircraft instead of running it down. Even if Germany has forged ahead in the past year, she probably won't stay there long. In 1938, Jane's "All The World's Aircraft" said the United States had the most formidable Army and Navy air forces in the world. Who has made most of the important innovations on aircraft if not America?

The reason Germany has taken the lead is because she has taken all our ideas and united them with her inventions. We must give her credit for the development of the Diesel in-line engine. It is something we should have taken up because it is so well suited for streamlining. I understand two of our largest engine companies are now working on in-line engines, so it won't be long before we are back in the lead—one or two years, not the five Mr. Williams claims.

I think Al Williams has been influenced by the Germans and the British. I would like to see him go up to a U. S. Army Air Corps office and say our air force is a farce. Something would probably happen right there!

Yours truly,
C. D., Toledo, Ohio.

Rushing to the defense of Al Williams, we beg to inform our correspondent that Al is a major in the U. S. Marine Corps Reserve and one of the greatest living test pilots and acrobatic fliers, so he should know something about his airplanes.

As for Army Air Corps officers starting something with Al if he said our force is a farce, I doubt if they would care to take the physical action the writer seems to imply. Al is a pretty husky specimen, weighing around the 200-pound

[*Continued on opposite page*]

Editor's Workbench Chips

[*Continued from opposite page*]

mark. He was a star athlete at Fordham University and spent some time as a rookie pitcher with the New York Giants, drawing warm praise from no less an authority than the late John J. McGraw. He might have carved an impressive career for himself in baseball, if he hadn't liked aviation more.

Besides, some of the severest critics of the U. S. air force are former Army Air Corps officers, and those still in the service probably would be if they were permitted to talk, which they aren't unless they resign from the service. True, the United States is now improving its air force at a very rapid rate, but it is constructive criticism by men like Al Williams which has caused the nation to wake up and go ahead with plans for an efficient, up-to-date air force. If criticism brings results, we would do better to have lots more of it than to eliminate it from the printed page.

***

Dear Sir:

When you reduced the price of MI to a dime I groaned, because I thought the quality of my favorite magazine was bound to suffer. Imagine my surprise and joy when, after reading it from cover to cover, I found it was as good as ever. MECHANIX ILLUSTRATED, even at ten cents, is still my favorite magazine, and I don't see how you can afford to put so much into it and still push the price down so low.

Yours truly,
W. K. H., Lexington, Ky.

This is the kind of a letter the editor loves to receive, especially when he can point with pride to still further improvement. We beg you to note that, in addition to maintaining its usual high standard of quality, MI has increased its size by 16 pages in this edition, and the larger magazine still sells for a dime.

***

Dear Sir:

I am enclosing the front cover of your May issue and asking you to send me twenty cents in accordance with your guaranty. The reason I am not satisfied with MI is because it contains too many articles on photography. Print more radio articles and perhaps I will give the book another trial.

Yours truly,
C. S., Dubuque, Iowa

We hereby inform the writer that we are planning a big increase in radio material, to begin in an early issue. We try to vary the amount of material on all subjects from month to month, in order to give our readers a balanced diet and so satisfy the interests of all of them. If your subject seems a bit neglected in one issue, try another one.

So long until next month.—*The Editor.*

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Military Planes Have Alphabet-Number "Soup"

"Oh, that BT-9's a mean one. It'll turn around and bite its tail in a minute."

"It's easier than messing around with a P-36, I say. But I like a real comfortable job, a B-17, f'instance, or even a C-39. Best of all is the Navy's PBY."

Newspaper readers will be seeing this alphabet-number "soup" more and more frequently during the next few months as the New Deal's air armament program gets under way, and hear it more often, too, as young men become involved in a program to make a nation air-conscious.

It's the airplane naming system of the Army and Navy in action, a form of government abbreviation that was here long before the New Deal began making initials popular.

Letters refer to a warplane's type and numerals to a particular model, the U. S. Army Air Corps explains. The Navy system is generally similar. The higher a number, in general, the more up-to-date the model is, although every now and then one comes along just to cross up the innocent layman. They've even got letters to show whether a plane is experimental, on service test, has finally won a place as a full-fledged weapon, or even whether it is modified from a standard type.

All bombers are designated "B." The "flying fortress," pride of the Air Corps, is the B-17. But when the Boeing Aircraft Company fitted it with special superchargers to permit high altitude operation, it became the YB-17A. The "Y" tells the cognoscenti it is on service test, the A that it is slightly different from the standard "flying fortress."

The B-15 is the "super flying fortress," half again as large as the Army's most famous airplane. Standard Air Corps equipment is the B-18, twin-engined bomber by Douglas.

Pursuit ship designations begin with "P." The P-26, a Boeing product, is now on its way out of service. It is being replaced with P-35s, built by Seversky; P-36s, Curtiss jobs with radial engines; and P-37s, similar to the P-36s, except for in-line engines. Deep and dark secrets are two later pursuit ships bearing the experimental designation "X"—the XP-38, a twin-engined fighter which streaked across the United States a few weeks ago at 400 miles an hour, and the XP-40, a single-engined affair. The BT-9 is a basic trainer for embryo pilots, as is the "BC-1," the basic combat ship.

Attack planes are the "A" class. Standard type

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now is the Northrop A-17; a modified version has been ordered and will probably be known as the YA-17A until it has been proved, after which it will become the A-17A. The YA-18 is a new twin-engined type by Curtiss. The observation plane in widest use is the O-47. Cargo planes, for ferrying personnel and supplies from one Army field to another, are principally the C-33, really a Douglas DC-2 14-passenger airliner without the upholstery; and the C-39, a DC-3. An experimental stratosphere plane is the XC-35. The "X" shows the Army isn't through fiddling with it yet.

Spectacles Are Fitted By Magicians' Trick

An old-time but still mystifying trick of magicians is being used to "fit" visitors with spectacles in a new exhibit at the New York Museum of Science and Industry.

In its new Hall of Optical Science, prepared especially for the World's Fair visitor, one looks into the exhibit and sees his face reflected apparently from a regular mirror. But across the bridge of his nose is superimposed any one of six pairs of spectacle frames from the old-fashioned kind of Ben Franklin's epoch to the modern streamlined style.

It's done with a mirror which is only half-silvered and semi-transparent.

Behind it is a revolving drum on which are mounted six different kinds of spectacle frames. The visitor looks at the mirror, sees the reflection of his face and at the same time sees a pair of spectacles behind the mirror, so aligned that the spectacles appear to be on the observer's nose.

The spectacles can be "changed" by turning a knob.

The average American family consumes more than half a ton of paper a year, says the U. S. Forest Service.

Green unshelled horse-chestnuts contain an oily substance which might be used in soap, so European chemists believe.

Giant kelp of the Pacific coast yields sodium alignate, used in stabilizing chocolate milk, ice cream and certain other food products.

Wool growers are reported to be alarmed over increasing use of delustered rayon which is cut to any length fiber desired and combined with wool so skillfully that experts find it hard to detect.

Synthetic rubber made experimentally from petroleum gases is seen as much cheaper than synthetic rubber from coal.

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Gasoline Made From Crude Oil By Hydrogenation

The chemical process of high pressure hydrogenation—by which Germany today makes nearly half of her gasoline—has been applied in the United States to petroleum with yields of one and one-fifth gallons of gasoline for each gallon of oil.

This yield, highest ever attained by any process of treating petroleum, was reported to the meeting of the American Section of the Society of Chemical Industry and the New York Section of the American Chemical Society by Dr. W. J. Sweeney of the Esso Laboratories of the Standard Oil Development Company.

Hydrogenation will become extremely important, Dr. Sweeney declared, when estimated United States supplies of crude oil reserves show signs of shrinkage. At present the method is not used commercially.

One hundred octane gasolines, high-powered low-knocking fuels for military and transoceanic airplanes, are now available commercially, said Dr. Sweeney in reviewing the newest feats of the applications of science to the petroleum industry.

Among the newest advances is the process of "alkylation," said Dr. Sweeney. This is a catalytic type of reaction in which a fragment of a hydrocarbon is hooked on to a gasoline molecule in place of one of its hydrogen atoms. This creates a "fish-like" molecule which burns slower than ordinary gasoline molecules and hence has a lower knocking value and higher octane rating.

Experimentally such gasolines have been created with an octane number of 125, according to reports to the American Chemical Society. Fifty per cent more power than present 100 octane aviation fuels is claimed for this new gasoline.

Modern technological advances in petroleum chemistry have greatly extended the estimated life of America's known petroleum reserves. In the early days of the automobile crude petroleum was distilled for its gasoline content and virtually all the rest of the vapors rejected and discarded.

Next it was found that crude oils could be "cracked" by heat and pressure to increase their yields of gasoline. Then, as the demand for higher octane gasolines increased, the process of polymerization came into being. Finally has come alkylation making gasoline even better and with even higher yields.

It is estimated that $100,000,000 has been invested in new refining plants for the petroleum industry and that when these are all in operation the more efficient processes will save the United States 500,000,000 barrels of oil a year, or about half the nation's present yearly consumption. Said another way, modern petroleum technology effectively doubles the nation's oil reserves.

Flint tools of Old Stone Age cave men have been found for the first time in Bulgaria in stratified sequence.

Test Flying Still Risky, Four Crashes Indicate

Despite advances in science which now enable engineers to predict with greater accuracy than ever before what an airplane will do long before it ever reaches the assembly line, the new military planes under development for the Army and Navy still have to be taken out on the flying line and put through their paces. And that—as the record of the last few months shows—still takes men who are willing to take rides.

Three Army officers cheated death recently when a 380-mile-an-hour attack bomber, one of three called the fastest bombardment aircraft in the world, ran into powerplant trouble and ended on the ground, a flaming wreck. A Seversky Aircraft Corporation pilot bailed out safely a few weeks ago via his silk umbrella when the single-engined pursuit plane he was flying caught fire over Wright Field, the Army's Dayton, O., test and experimental plant.

But Johnny Cable, chief test flyer for Douglas, wasn't so lucky. Johnny, one of the most popular men in aviation, died in the crack-up of a Douglas attack bomber, built for but never delivered to the Army. The crash touched off the recent dispute between New Dealers and critics of President Roosevelt's foreign policy, for aboard at that time was Captain Chemidlin, French air inspector.

Test flying civil aircraft also has its trials and tribulations these days. Only a few weeks ago a giant Boeing 307, designed to carry 33 passengers through the substratosphere, was pulled out of a trial tailspin too sharply and crashed when the wing buckled under the strain.

The recent crash of the North American attack bomber and the Seversky accident are more trouble than Wright Field has seen in a few years. Not since the crash of the first flying fortress, in 1935—and that was due to pilot error—has an important new design been involved in a crash, according to an Army spokesman.

Though test flying is risky business, its primary intent is to make the airplanes that go into regular use far safer than they would otherwise. For the test pilot is no ordinary flyer: he is a man who must give a ship all it will take—put it through maneuvers more severe than any it will be subjected to in regular use.

A wind tunnel can now give valuable information about an airplane's spinning and other flying characteristics. Static load testing can simulate and exceed the strains of flight on wings and tail assembly. Test stand runs can try an engine more severely than ever an airplane will. But there are always differences between performance under laboratory conditions and what a plane will do up in the air. It is to find out those differences that test flying is relied on and will continue to be for years to come. Test pilots, besides flying and engineering skill and knowledge, must still have iron nerves.

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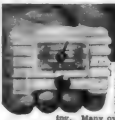

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Rubbing Tongue With Ice Kills Taste Of Medicine

If you have bitter medicine to take, rub your tongue with ice and you won't know you aren't dining on milk and honey. This useful advice is based on observations of Dr. Harald Tangl of the University of Budapest.

However much sugar is put in ice cream it won't taste too sweet because buds on the tongue scarcely function when they are cooled. For this reason warm coffee requires less sugar to sweeten it than iced coffee. Warmth is a stimulant to the taste buds.

These taste buds are unevenly divided in the world of nature. An antelope has 50,000; a man has 3,000; a cow has 15,000. The whale has only a few; he gulps his food so quickly that taste is no object. Among horned cattle, taste is important, and they scrupulously select the grasses they like.

While man tastes only with his tongue, fishes taste with their whole body, according to Dr. Tangl.

A baby tastes with the middle part of his tongue and an adult determines with the sides of his tongue whether food is pleasing or not.

There are four distinct tastes: sweet, salty, bitter and sour. The sweet taste is perceived on the tongue most quickly, because the buds reacting on sweets are located at the tip of the tongue. Next comes salt and then comes sour. Bitter things are tasted at the back of the tongue.

The taste can be trained. Tea tasters can tell the place of origin of a tea after a single tasting. Wine tasters can tell where the grapes were grown and whether they grew in a shady or in a sunny field.

Silent Camera Developed For Sound Motion Pictures

For the first time since sound motion pictures came into use more than ten years ago the motion picture industry has a noiseless camera which can be used inside a sound studio without any soundproofing box, or "blimp" as it is known in the industry.

The new silent camera, weighing only 60 pounds, was described to the Society of Motion Picture Engineers by G. Laube of the Twentieth Century-Fox Film Corporation. The monitor view finder truly conforms to the image being photographed on the film so that the cameraman no longer has to make allowances for parallax. The camera turret mounts four lenses which are quickly changed, while the entire camera is sealed from the action of sand, dirt or water.

A scientific study of the rumbling sound that accompanies most earthquakes has been made.

Student Taught Blind Flying Above Clouds

Pictured in flight above the clouds is a radio-equipped "blind-flying" Ryan S-T training plane, which is used in giving advanced instrument flight instruction. Note that the student pilot, who occupies the rear cockpit, is completely covered by a hood which makes it necessary for him to maneuver the plane entirely by instrument. The flight instructor in the front cockpit acts as "check pilot."

First phase of the flight training given "under the hood" is blind-flying, in which the student pilot learns to maneuver the plane solely with the aid of his instruments. The second phase of the training is radio beam flying, in which the pilot learns to locate his position by means of radio beam signals which are broadcast from radio stations on the ground and picked up by the plane's receiving set.

New Telescope Covers Greater Area Of Sky

More sky can be seen with the new McDonald Observatory 82-inch telescope at Fort Davis, Tex., than with any other American telescope. This is because McDonald Observatory is farther south than any other observatory in the United States.

It can be sighted upon thousands of stars that never came within range of more northern telescopes. The entire sky except for a 30-degree radius circle around the South Pole will be covered by the new telescope giant.

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Fireproof Materials Protect U. S. Ships

The flaming disaster which overtook the French Line's S.S. Paris in Le Havre could not occur on ocean liners now being built in the United States, Commander H. L. Vickery, chief of the U. S. Maritime Commission technical section, said.

New fireproofing materials developed aboard a floating fire research laboratory, the S.S. Nantasket, as a result of the Morro Castle disaster four and a half years ago, make it impossible for a blaze to spread from one part of a ship to another, he said. Their use is compulsory on new ships.

Three vessels with the new type of construction, the S.S. Panama, S. S. Ancon and S. S. Cristobal of the Panama Railroad line, are already in passenger-and-freight service. The S.S. America, under construction in Newport News, Va., and the largest merchant vessel ever built in this country, also features it, Commander Vickery explained.

Combination cargo and passenger ships of the C-2 and C-3 types, of which more than a score are now on the ways of shipbuilders, are also immune to such destructive fire. Oil tankers built during the last seven years are similarly protected.

Chief feature which eliminates the possibility of a repetition of the Morro Castle or Paris disasters on any of the new steamers is the substitution of non-combustible backing for partitions and bulkheads in place of plywood generally used on older vessels, the Maritime Commission authority declared.

Materials based on asbestos or rock wool not only prevent the spread of fire, but reduce heat transfer and so make it impossible for anything to catch fire on the opposite side of the partition from a blaze. The general principle, Commander Vickery continued, is the isolation of a fire and the insulation of a ship against its spread. This has not been previously done.

The worst that can happen on the new American ships is a fire in a single compartment, which can be put out easily, or if necessary, be permitted to burn itself out. Dozens of new materials were tried aboard the Nantasket, which was operated by a Senate technical subcommittee set up to inquire into safety at sea and which was headed by George Sharp, New York naval architect who has pioneered fireproof construction afloat, before the right ones were found.

Although Cortez and perhaps Columbus watched Indians playing with rubber balls, it was over 200 years before any semi-scientific report on rubber and its possibilities was received in Europe.

Chinchillas are so rare and valuable that a coat made of 120 pelts would cost at least $60,000.

Aviation Laboratory Opened By Mayo Clinic

The Mayo Clinic, mecca for medical men and the ill, has added to its tremendous research facilities an aviation medicine laboratory to study problems brought in the train of their age.

A low pressure tank simulating conditions at high altitude, similar to the Army's tank at Wright Field, O., has been installed in a new Laboratory for Metabolic Investigation and Aero-Medical Research. Both the Army and Navy are expected to cooperate with the Clinic's new research unit.

The laboratory is in charge of Dr. Walter M. Boothby, who with Drs. A. L. Bulbulian and W. Randolph Lovelace, II, invented the Clinic's most recent contribution to flying—the B.L.B. inhalator, an oxygen mask for use at high altitudes where the air is too thin to keep human beings functioning properly.

Effects of high altitude on the human body, and of rapid climbing and descent—both encountered in military flying, for example—are to be investigated by Dr. Boothby and his associates.

The effect of low atmospheric pressure on the human body, when oxygen is being taken through a mask, is also to be studied. At 18,000 feet, for example, the pressure is only seven and a half pounds per square inch instead of 15 pounds as at sea level. It is suspected that gases breathed in through the mask may diffuse more readily under the high altitude conditions.

Use of helium in a mixture with the oxygen to enable more rapid descent without producing earaches is also to be studied. Already tried with considerable success, helium's relieving effect is believed due to the fact that the light gas diffuses through the Eustachian tubes to the inside of the ears much more rapidly than air, with the result that pressure inside and outside the ear is equalized. It is this difference in pressure which pains the eardrums.

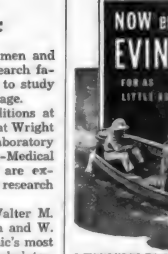
Fruit of the hurricane plant ripens so slowly that eating a single fruit is a process of several days.

A new self-sealing tire tube is said to withstand punctures by objects up to the size of a ten-penny nail.

A new camera judges bread and cake by taking a picture of the inside cell and crumb structure.

Oil extracted from a ton of cottonseed may vary from 97 pounds to 396 pounds, according to tests.

Bismuth has the distinction of being the metal most repelled by magnets.



• Never before an Evinrude so inexpensive to own, so handy and economical to operate. The sensational new "Mate" fits your own or rented boats—drives row-boats up to 4½ miles an hour, canoes up to 6 miles. Runs all day on a single gallon of fuel. Amazing starting ease — a flick of the starting cord and you're away! Write for catalog today!

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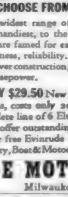

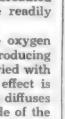

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W. H. FAWCETT, Publisher

VOL. XXII No. 3

JULY 1939

SCIENCE SECRETS REVEALED At NEW YORK WORLD'S FAIR

Cosmic rays, electronic energy and light power are but a few of the invisible influences harnessed by science, whose magic show dramatizes its researches and discoveries for the Fair's sixty-million visitors. Here's a partial review to whet your appetite for this fascinating scientific show.

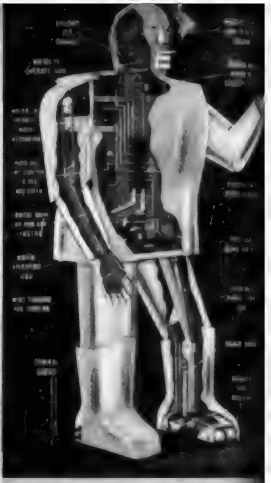
by Stanley Gerstin

Above: Science shows what invisible germ-existence is like in a drop of water by magnifying the life and death scenes of germs 2,000 times. Right: The sodium streamer is the largest sodium bulb ever devised in the laboratory. Thousands of multi-colored bubbles float inside.

SCIENTISTS at the New York World's Fair are putting on a show that makes Aladdin and his magic lamp look like a piker!

They are in control of invisible forces whose secrets they use to baffle, amaze and entertain!

So don't take it on the lam if you hear your voice



Elektro, the mechanical robot, performs its tricks, walks, sings, dances (see left), counts on his fingers and talks back! This drawing shows how 11 motors, controlled by 48 relays, function. His "brain" or control unit, is outside his 260-pound hollow aluminum body.

come in the door and go out the window. And don't see your eye doctor if you suddenly observe an electric fan reverse its motion and cut capers when mesmerized by a flickering light. For this is part of the show—and the show will have only just begun. Shortly, a gigantic Frankenstein of aluminum, obeying the barked commands of its human director, will take over as a master of ceremonies in this fantastic temple of science.

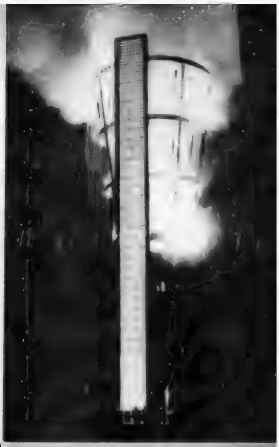
Electronic energy, television, radio, X-ray, ultra-violet, shortwave, light power—these are but a few of the sources of invisible influences that are made to perform for you as the servants of science!

A few faint cosmic rays arriving upon the earth from distant reaches of interstellar space ring a bell and officially open the show. As you enter the awe-inspiring Hall of Man a low, rhythmic throbbing greets the ear. It comes from a giant 22-foot figure of a man with a shining blood-red heart illuminated in his breast. The mechanism of the heart simulates that of humans which makes three billion beats without a halt (you hope) in a 75-year lifetime.

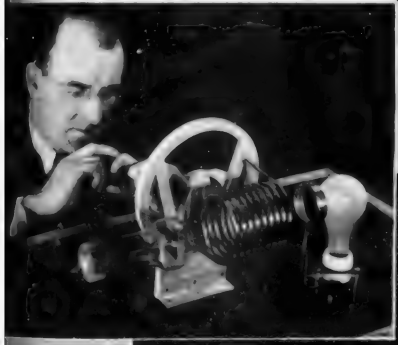
A "pain-man," a life-size reproduction of the torso, is marked with buttons on the 11 spots where pain occurs most frequently. A visitor pushes a button and a glass chart lights up showing the probable cause of pain in that region. Visitors walk into a giant replica of the human eye and look out of the pupil as the world—as the near sighted, far-sighted and color-blind see it. The visitor's lung capacity is measured by the spirometers; his muscular strength and fatigue by ergographs; the bony structure of the hand by fluoroscope. There is even a life expectancy machine—which is as near as you may want to get to looking your fate in the face. The famous Lindbergh-Carrel heart is on display and an operation will be performed on life-size breathing dummies so that you can watch what happens (or would happen) to you when you take an anesthetic for an operation.

Now step into General Electric's "house of magic," where you will be initiated into the mysteries of the fluorescent stroboscope, which changes color and pattern as it revolves at high speed. The stroboscope is a phosphorescent-coated disc whose pattern changes according to the speed of a flickering light directed upon it. Equally amazing is the inducto therm (sometimes known as the fever machine). This machine enables a person to light a bulb in the hand simply by forming a loop with the arms. What actually happens is that a radio wave transmitted from the inducto machine induces an electric current to flow through a tuning loop formed by the arms, and the current thus flowing through the body lights the bulb. Science has discovered that the inducto therm is invaluable in giving people radio wave treatments for arthritis, and other ailments.

From the inducto therm, the scientist turns to the sodium streamer (illustrated on the cover) for a display of colorful gas bubbles induced simply by charging the argon atmosphere in the huge sodium bulb with electricity. This is the "Sally Rand" exhibit of the show, except that when the bubbles burst—others take their place! What actually happens is that the electric



Westinghouse's 120-ft. "singing tower of light" is bathed in color and smoke as water fountains shoot 75 ft. upward, and music plays to the tune of changing colors.



Left: Radio waves heat this miniature furnace! High frequency coils make the bulb light and vertical tube glow. In commercial application it is used to heat materials in a vacuum to drive out the gases.

Remote control by radio enables the operator to run this train from a distance. Frequency of sound is what does the trick, although in actual demonstration it seems as though the words spoken are what makes the train run down the track.

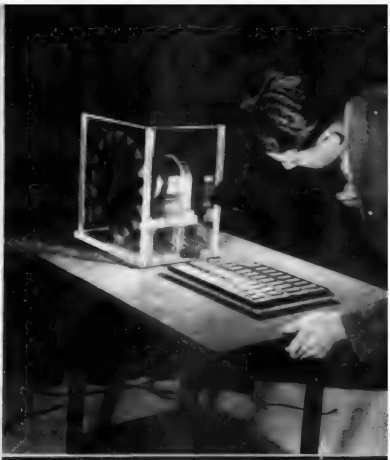
A powerful magnet makes the plate float free in the air (above). So if you see a bowl of cherries coming towards you in the dark, at General Electric's show, don't run! Below: Playing the marimba with ordinary flashlights is no trick if you know the secret. Read the story for an explanation of how it's done.

charge turns the gas into a golden boiling mass, in the neck of the bulb, which shoots up a shower of colorful gas bubbles. As they strike the top of the bulb, they spread out fan-like—and burst. But a constant shower of new bubbles of every color in the rainbow take their place. This sodium bulb is the largest ever made and its life is unpredictable.

Maybe you think it is easy enough to perform scientific wonders with the aid of electricity, but science shows that it has harnessed the power of ordinary light itself to drive a mechanical engine. This trick is achieved with the aid of the "sun machine." By concentrating light upon a group of photo-electric cells, energy is set up, which when transmitted by wires to a small dynamo, drives a flywheel and shaft. Scientists don't like to commit themselves on the possibilities of using power from light alone, or from the sun, but laboratory experiments now being carried on indicate that sun-power will someday be made to supply light and power to homes and industry. Spectators who see this exhibit and get fantastic ideas about using sun-power to wash the dishes, cook their meals and drive their automobiles will not be far wrong.

As a matter of fact, autos, airplanes and trains are already being driven by remote control, so if you see a small train cavorting up and down the tracks to the commands of a human voice—blame it on the scientists and not on your eyes. The train is controlled by radio and what happens is that human sounds are transmitted by a radio control unit as a series of signals which automatically set the train in motion or stop it. The principle is somewhat the same as that used in controlling the mechanical man which will be described later. When a speaker says "Go Back," sharply, two clicks are heard in the

The stroboscope (above) gives a fascinating demonstration of changing colors and patterns as the disk revolves before a flickering light. Right: Light from the sun or any other object is used to run this sun machine. Ultimate possibility is that sunlight may be used to wash the dishes, clean the house and cook the meal!



controlling machinery. These two clicks automatically set the controls in motion for reversing the direction of the train. In similar manner the train is made to move forward, to stop and start, etc., depending on the predetermined number of emphasized syllables spoken by the attendant in ordinary speech.

At Westinghouse's "world-of-scientific-wonder" you are stopped by a 120-foot "singing tower of light." This strange structure is like an inverted cone and is formed of six concentric metal rings. The rings are separated by tubular rods with insulators symbolic of the electrical industry. They are connected to the tower face which contains circuits of red, green, and blue lights.

The tower sings! In operation, automatic valves control a series of water spouts which climb in varying heights up to 75 feet, rising and falling to the impulse of an unseen electrical master. As the lights dance, and the water spouts upward to a musical accompaniment, a cloud of smoke gradually rises toward the rim and the entire tower is enveloped in a many-colored mist.

The mechanical man is a robot nightmare come to life; an actual monster of metal that stands 6 feet 10 inches high, weighs 260 lbs., and walks, talks, sings, dances (just a simple waltz—no jitterbug stuff), smokes, knows colors, smells flowers and counts on his fingers. Call him Elektro.

He has 26 tricks in his repertoire and looks like Frankenstein Karloff. He is operated by 48 electrical relays (circuits actuated by

[*Continued on page* 114]

Girl Exhibits Safety Gadgets

DENORE DOLIN prepares herself for all sorts of emergencies by wearing some of the safety devices exhibited at a safety show in New York City. Around her neck is a felt filter respirator. A transparent mask protects her face. Steel plating encases her shins and feet. The toe-guards, capable of withstanding a falling three hundred pound object, are used by workers in ice plants and steel mills.

Arabs Try Out Skis On Sands Of Desert

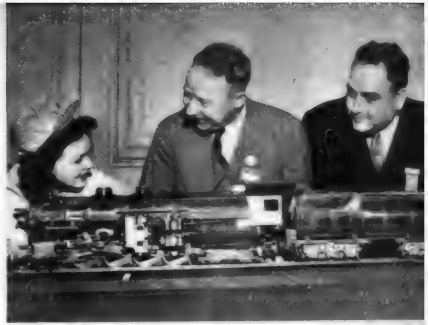
A NEW idea for ski enthusiasts comes, not from the frozen north, but from the hot sands of the Sahara Desert. A couple of Arabs are shown here, trying their hand—or should we say their foot?—at this new form of desert travel. The bottom surfaces of their skis are treated with a special preparation to make them slide easier over the sand. Perhaps skis will supplant the camel as the ship of the desert. Or perhaps we will soon hear of summer ski trains being run to our own Mojave Desert.

Electricity Drives Giant Coal Truck

THIS giant truck, which hauls a 70-ton load of coal, is driven by electricity. Two generators, each direct-connected to a Hercules engine under the hood of the truck, furnish energy for traction motors connected to the two rear end drives. The Hercules engines burn butane, a very volatile fuel. The trailer is 35 feet long, 10 feet high and 12 feet wide.

Model Locomotive Valued At $10,000

A SCALE model locomotive insured for $10,000 was exhibited at the convention of the Association of Brotherhood of Locomotive Engineers and Firemen and Grand International Auxiliary. It can generate 150 pounds of steam and travel 150 scale-miles an hour. Viewing it are Jerry McMillin of the auxiliary's reception committee, George Meredith, engineer, and Guillermo Fernandez, delegate from Mexico.



Air Resistance Cut In New Luxury Plane

ENGINEERED for luxury, the new Lockheed Vega has a top speed of 210 miles per hour, a 1,060-mile cruising range on 160 gallons of gasoline and a workable ceiling of 21,500 feet. The two engines of the 5,750-pound ship are hitched side by side and geared to one propeller, thereby eliminating the head resistance two bulky motors usually cause. In an emergency the Vega can fly on one engine. It measures 41 feet from wingtip to wingtip and has automobile-like accommodations for six persons.

Builds Gas Station Like Tank Train

AN UP-AND-COMING gasoline station owner of Cleveland, Ohio, devised this means of catching the motorist's eye—and successfully, too. He had his station built to appear like a railroad tank train, with the gas pumps built into the side of the locomotive and tender. Motorists stopped to look at the unusual sight—and while looking they often bought gasoline.

Machine Builds Muscles

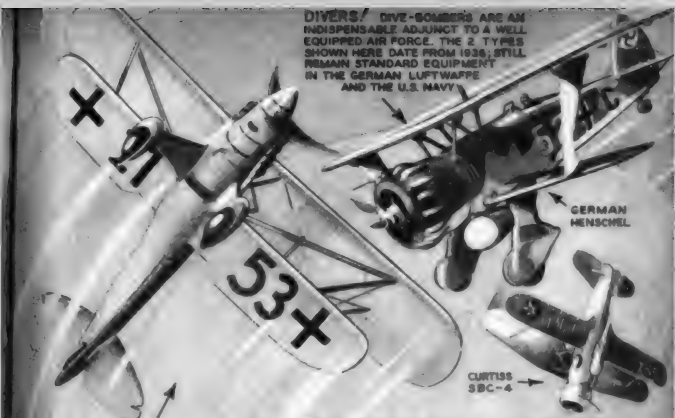
THE young lady below is getting all the beneficial effects of rowing and riding from the machine on which she is exercising. It strengthens and stimulates muscles and internal organs.

Magnetic Pulley Lifts Man

THE terrific pull of the largest magnetic pulley ever built is strikingly demonstrated above. The man is wearing thin steel insoles on his shoes. The pulley protects ore crushing equipment from damage which may be caused by tramp iron carried by the ore along the conveying belts. It extracts the iron, allowing the ore to continue on its way.

Tiny Car Will Go 60 Miles On Gallon

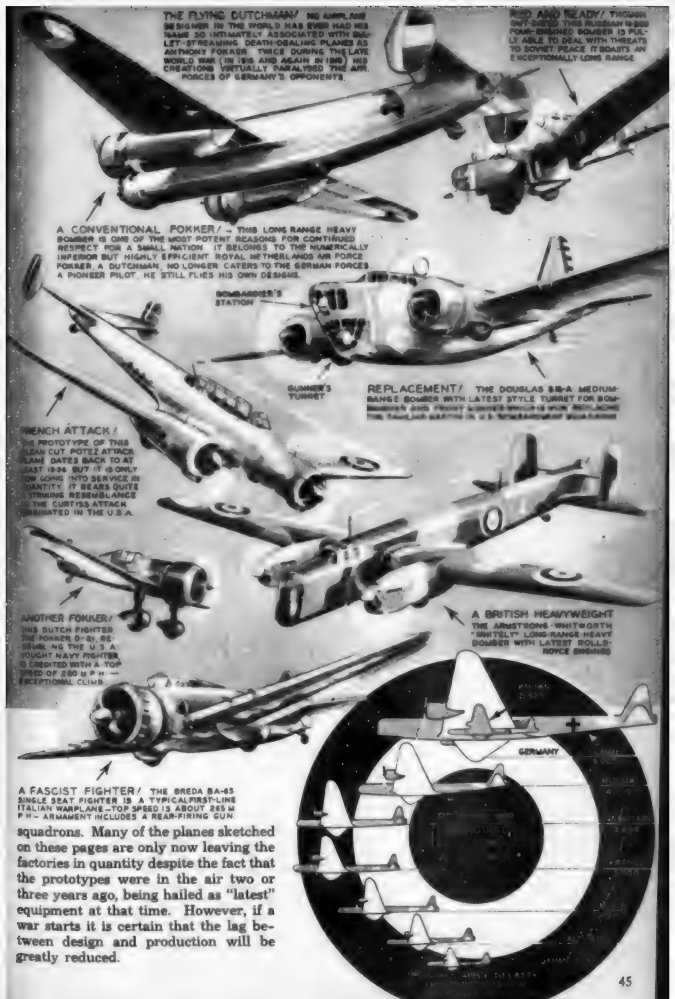
THIS pocket size auto is termed "the forgotten man's car fit for a king" by Powel Crosley, Jr., its builder. It is ten feet long, nearly five feet high, weighs less than 925 pounds and will go close to sixty miles on a gallon of gasoline. An aviation-type, two-cylinder, four-cycle engine is the power plant. Airplane principles have been used to cut weight.



REPRESENTATIVE FIGHTING PLANES OF THE WORLD

RECENT issues of MECHANIX ILLUSTRATED have presented some of the latest developments in military airplanes. Due to the more spectacular aspect of the pursuit phase of military aviation the latest high-speed single-seat fighters have attracted the most attention. However, the airplanes illustrated on these

pages are more generally representative of the types which would be called into action in event of a major war breaking out this year, inasmuch as due to the lag between design and actual production it may be months, even years, before the experimental plane or prototype reaches the production line and is delivered to service



squadrons. Many of the planes sketched on these pages are only now leaving the factories in quantity despite the fact that the prototypes were in the air two or three years ago, being hailed as "latest" equipment at that time. However, if a war starts it is certain that the lag between design and production will be greatly reduced.

Mattress Floats Girl

MISS RUTH WRIGHT demonstrates how to take it easy while fishing. The new floating mattress, on exhibition at the Sharon, Mass., Rod and Gun Club, weighs only 37 pounds, will float four persons and is unsinkable. It was designed for fishermen who wish to travel light.

Ready For All Disasters

AN IMPOSING looking 12-ton disaster truck was presented recently to the fire department of Portland, Ore. It is unique in that it is the only one of its kind in the United States. Specially built, it contains more than 1,200 separate articles, assembled to meet every conceivable kind of disaster. In this scene firemen are demonstrating the truck's three portable generators and its lighting plant.

Miniature Trains Carry Zoo Visitors

THE Dudley Zoo in Worcestershire, England, has inaugurated a miniature railway system to save wear and tear on the feet of its visitors. Diminutive cars drawn by tiny engines are used to transport spectators from place to place to see the various animals. The little girl seated on the engine while she polishes it gives a good idea of its size. In the larger photo workmen are busy on the turntable.

Bottle Caps Adorn Veteran's Place

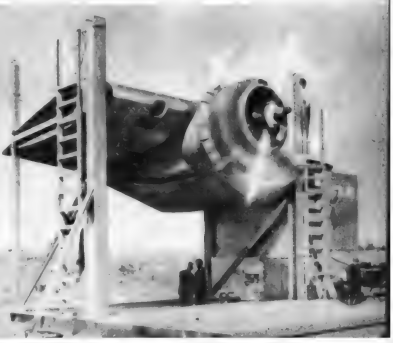
BOTTLE CAP INN is the name given to this unique spot in Miami, Fla. Its owner is Joe Wise, a disabled war veteran and carpenter. He used, according to his estimate, 600,000 bottle caps to adorn the interior and required a year and a half to complete the job. Imagine the skyscraper of glass that would result if all the bottles from which these caps came were heaped together in one place!

Transparent Auto Exhibited At Fair

THIS transparent automobile was exhibited at the New York World's Fair. A crystal clear plastic is used to form the fenders, hood and outer body panels and reveals, among other features, the interior bracing and the ventilation system. With windows that raise and lower, doors that open and close, the transparent car is complete in practically every detail and could be driven out on the highway.

Plane Engines Given Test Before Flight

BY MEANS of this new test rig, builders of flying boats and high speed bombers can tell how an engine will work on their planes before going to the expense of building the planes. Performance of power plants under conditions to be met in a newly designed wing are checked by engineers, who study instruments on the balcony at the right. The rig is on a turntable so the engine can be turned into the wind, down wind or cross wind. It saves hours of test flying, which previously was the only method of determining performance.



He Makes Money

Here is the story of a drummer boy who made good as a musician and as an inventor. His ideas for kitchen gadgets and musical aids have netted him a fortune. Write to the editors for any information.

SWEET MUSIC!
Billy Gladstone, inventor par excellence, plays a tune on the piano with his patent certificates as his score. And it's no penny serenade, but a song more to the tune of "So I Took the Twenty Thousand!" If you doubt it, take a look at those royalty checks protruding from the top of the patent certificates. This is something to sing about!

BILLY GLADSTONE, in the short space of a few years, has invented no fewer than 40 items, has 17 patents and a dozen pending, and is tinkering with six or seven other ingenious creations!

One of his inventions, a pair of sock cymbals, has netted him $7,000 to date; others are pouring in royalty checks weekly with three and four figures on them. His royalties are running into thousands of dollars. He's a gilt-edged inventor, worth his weight in gold. A million-dollar prodigy!

Inventor Gladstone is a successful musician as well. As a matter of fact, inventing is just a side line with him and William D. Gladstone may be seen any day wielding the drum sticks in Erno Rapee's Radio City Music Hall's orchestra in New York City. Dreamy and dapper, he taps out his tunes on traps and drums—while thinking of another invention for all anyone can tell by looking at his poker face!

Being one of America's drum wizards, it is only natural that this inventor-musician has turned his inventive skill to musical lines. But his talent for all sorts of kitchen gadgets and other novelties is no less rich and productive.

Take his patented key case, the first royalty for which, amounting to $681.16, arrived in the mail on February 1, 1937. For 10 years Billy had tried to work out a nebulous scheme for a key holder that would not bulge in the pocket and yet would be at once handy and simple to manufacture.

But he could do nothing about it because

While He Plays

by Allan Finn

Above: The idea of the key ring came to inventor Gladstone while he was tapping away at his drums. The keys are strung on a chain attached to a handsome case that may also be used as a change purse.

The two views of the juice strainer shown at right show another of Gladstone's inventions come to life. It strains orange juice quickly and easily.

A $7,000 sock! That's what was dropped into the lap of musician-inventor Gladstone whose invention of the sock opener shown below being used by a fellow musician. [illegible] symbol-sound [illegible] And it all happens [illegible]

the budding inventor had only the vaguest concept in mind. Finally, one day a woman harpist at the Music Hall dropped her change purse, spilling out in the pit several keys in addition to some coins.

Billy picked up the keys and strung them for her temporarily on a small chain which he attached to an empty key case he carried. "This'll do until I get my own key case invented," he told her.

By a curious quirk of fate, he had accidentally struck upon the thing he had been wracking his head for. The makeshift key case attracted attention in the orchestra. Other musicians, thinking he had realized his invention, asked him for cases.

Billy borrowed the harpist's key case, put some coins in with the keys, and took it around

Inventor Gladstone early conceived the idea of using Plexo for medical instruments; promptly designed a tongue-depressor with this transparent material that eliminated the "blind spot." Then Gladstone went himself one better and redesigned the tongue-depressor with a built-in flashlight which he holds in his left hand in the photo on the right. In his right hand is his famous unbreakable illuminated baton which has proved a boon to orchestra leaders everywhere.

to a model maker. The model proved satisfactory and the Gladstone key case hit the market with an immediate favorable response. The device is now being pushed all over the world and fat checks are coming in regularly.

An orange juice strainer, for which he has a patent pending, was born one morning as he sat at a drugstore soda fountain. In a hurry, he fretfully watched the clerk laboriously separate the pulp from the juice of an orange with one of those familiar perforated tinpieces that fit over the top of a glass. The process seemed to him ridiculously slow and tedious, so that night when he got home he began sketching an idea for something that would do the job faster. The strainer is shown on page 49. The gadget looks like one of those mechanical egg slicers. It consists of a series of parallel wires attached to a convexed base, whose bottom is cut into rows of metal slabs. This fits over the top of a glass, and when the orange is squeezed the wire attachment is moved up and down with the thumb. The wires, which fit into the slits between the slabs, force the juice down through the slits into the glass while the pulp settles on top of the slabs.

The success of this idea got Billy working on an orange juice extractor which is destined to do the job without cutting the orange! The model manufacturer is still wrestling with Billy's crude drawings, so the young inventor is naturally chary about discussing it publicly. Very briefly, however, it is a cup-like contraption with a shaft-like knife which penetrates the fruit, decoring it and releasing the pulpless juice in one swift, clean operation. A manufacturer is already making plans to handle this invention.

The chances are that Billy Gladstone could sit back and live on his accumulated royalties and his inventive genius, for the income from his musical creations alone run into a substantial figure. But drums are his first love and he can't leave 'em alone.

He says: "As soon as those sticks begin to fly from the percussions something magic touches off a spark in the back of my head. It's Aladdin-lamp like. Ideas start to pop. I get all steamed up."

Sometimes, too, Billy gets so steamed up that he forgets to turn the pages of his music as he sits in the great Music Hall orchestra pit, or slips momentarily into "inventor's sleep," but Maestro Rapee just smiles understandingly.

More often, though, Billy follows Mr. Rapee's baton with slightly more than a musician's eye. He follows it with a proud and

loving eye. He is the inventor of the Rapee baton. The patent for it is pending, but the baton has been manufactured for a year and a half anyway, bringing him hundreds of dollars in royalties.

The Music Hall audience sees little of the baton. It's part of the idea. The baton glows in the dark, its tip visible from all parts of the theatre but its full length exposed only to the musicians and stage performers. This effect is obtained by the use of Lucite, a transparent material which is illuminated by reflection internally. The light is provided by a small flashlight battery in the handle of the baton.

Billy says the idea came to him when he saw that an ordinary baton was not always visible at once to the entire orchestra. He also knew that Maestro Rapee was rough on the wooden sticks, breaking one or two daily. His patented baton, however, is virtually unbreakable. Besides Mr. Rapee, Rudy Vallee, Edwin Franko Goldman and other conductors have adopted it.

By extending the handle end of the luminous baton, Billy turned it into a new kind of blackboard pointer which is being used in schools and lecture halls. More royalties!

Using the same principle of reflection, he also invented a tongue depressor, which is a veritable boon to throat doctors. This small device not only presses down the tongue but provides the light at the same time. The material is of Pirex rather than Lucite for sterilizing purposes. This patented depressor is used in the Music Hall Hospital and by several New York specialists. A surgical instrument company has begun to manufacture it on a large scale.

Billy Gladstone's first musical creation appeared on the market in 1925. That was a bass-drum that operated by the heel as well as the toe. His famous sock cymbals came next and have been sold from Scotland to China. These cymbals are mounted on aluminum handles; they are constantly in contact with each other, enabling a drummer to operate them with one hand while the other hand is busy with something else. When struck by a stick the cymbals produce a sizzling effect, which is one of their top features.

Billy's greatest musical invention is a new snare drum. It's a real help to the skin beaters. This drum can be tuned as it is played without taking it off the stand. The invention consists of an ingenious arrangement of the regular rows of rods on the side of a drum which lightens the snare control, eliminates overtones and improves the instrument's tonal qualities generally. Moreover, the key, which drummers have had to rummage in their pockets for to make quick turns of the rods, is always at hand on a metal peg clamp right on the drum.

Maestro Arturo Toscanini and other sym-

[*Continued on page* 116]

Above: Before Gladstone conceived the idea of anchoring the special drum key on the side of the drum (arrow points to screw plug) drummers never could find the key (shown being used) when they needed it in a hurry. Right: Another invention that aids the drummer is shown at right (see circle). The tone of the drum is instantly changed by flipping the handle with the stick without the drummer losing a beat. It's a "beat."

Radio Controls Model Plane

JOSEPH RASPANTE, who runs a radio shop in Brooklyn, N. Y., combined business with his hobby to build this radio-controlled model plane which responds instantly to its control buttons. Six feet long, having a wing spread of ten feet and weighing eleven pounds, it cost $350 and took two years to construct. A foot long aerial and a receiving set in the cabin take impulses from a six feet tall aerial, a transmitting unit and a ground selector. By pushing a button on the latter the operator causes the plane to obey his signal at once. The model will perform readily all normal plane maneuvers.

Above: Raspante's plane in flight. Below: The ground control selector.

The transmitting unit is in the center of the above photograph. At the right is the ground selector, which guides the plane.

Above: The model is unloaded from Majestic Gas Model Club's truck for a test flight. Right: Raspante uses heavy duty batteries to check performance of the plane's four-tube receiving set before sending it into the air.

Electricity Aid To Modern Farmer

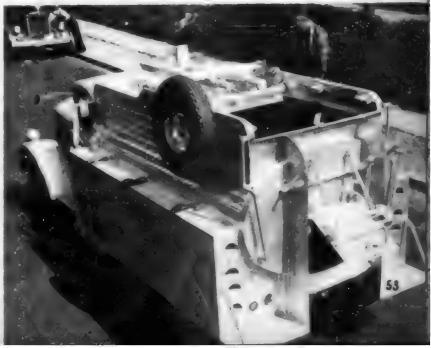
THE modern farmer lets electricity make his work easier, this novel exhibit at the New York World's Fair reveals. The two miniature farmers discuss electrification by transcription, showing that the old-fashioned farmer does most of his work by hand, while his progressive neighbor uses electric power to shorten his working day and make farming profitable.

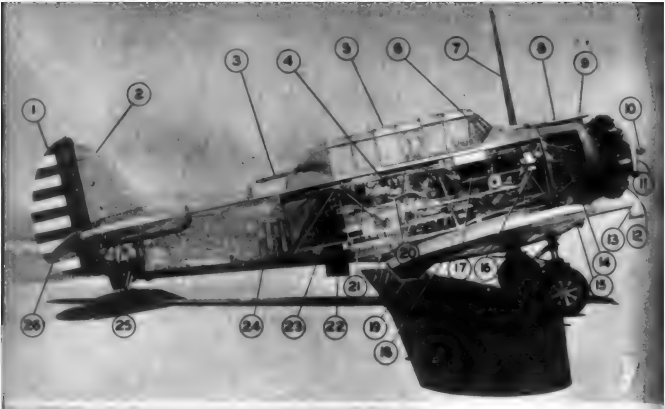
Television Device Designed For Radio

A NEW television attachment reproduces images of the size shown, using the chassis and loudspeaker of any AC-operated radio for accompanying sound. It uses 16 tubes in addition to a five-inch projector tube.

Trucks Carry Fish To Spawning Grounds

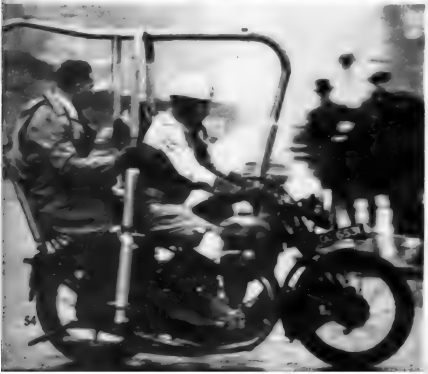
SIX of these trucks were designed to carry salmon over the Grand Coulee Dam, Wash., during spawning season. Each has a tank on the back which holds 500 gallons of water and 400-500 salmon. The fish are put in the opening at the top and carried over the dam. There the truck is backed on a pier, the rear door is opened and fish and water pour out together into still water.





Reveal Plane Structure

AN ARMY plane looks simple from the outside, but peel away the fabric and you see: (1) rudder; (2) vertical fin; (3) machine gun; (4) phone; (5) cockpit enclosure; (6) instrument panel; (7) radio antenna; (8) machine gun; (9) air scoop; (10) propeller shaft; (11) manifold; (12) motor; (13) pitot tube; (14) magnetos; (15) landing lights; (16) cartridge ejector tube; (17) radio; (18) gas tanks; (19) landing flaps; (20) emergency stick; (21) safety belt; (22) camera "peep-hole;" (23) camera; (24) flares; (25) stabilizer; (26) elevator.

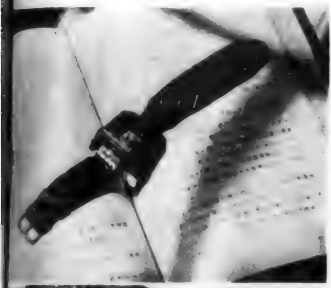


Long Distance Cycle

PUTT MOSSMAN, English motorcyclist, and his mechanic ride along a London street at the start of a trip to Cape Town. The pipes overhead contain extra gasoline for long jaunts through African desert, where they won't find service stations.

Invents Wrist Watch Camera

A WRIST watch camera is the brain child of Jujiro Ichiki, Japanese inventor. It takes real pictures, making 36 exposures with one loading, and is equipped with an f.4.5 lens. The focusing scale graduates from one foot to infinity. What a wonderful device this would be for a spy!



Organ Grinder Uses Radio

FACED with the necessity of spending $300 for a new hurdy gurdy when his old one broke down, Joe Puma, Chicago organ grinder, thought out a solution for his economic problem. He bought a portable radio for $30, rigged it with the post and neck strap of his old organ and went out on the street with his monkey. He claims the monkey likes the radio better than the organ.

Soldiers Wear Camouflage

THE men in the above picture are not inhabitants of Mars. They are only British soldiers, wearing camouflage in their helmets during a mimic battle.

Human "Fish" Stage

Above: This is the seven-foot deep tank from which cameramen film underwater scenes while Newton Perry and his prize class of breath-holders cavort about among the fish. The tank has a glass wall on one side so that the cameraman can shoot scenes 40 feet distant under water. Below: Newton Perry (left) and his assistant are nailing down props for the movie "Underwater Romance." They hold their breaths from 45 seconds to 1½ minutes.

IN CRYSTAL clear water where the bottom may be seen 20 feet below the surface, Newton Perry, king of the sub-surface film stars, sets up his props and performs his thrilling underwater movies with the competent aid of a troupe of specially trained sea nymphs. Maybe you have already seen these underwater films in which the actors cavort about like fish and never seem to breathe. The secret of making these fascinating films lies in the fact that Subsurface Perry picks especially good swimmers, (young ones), and trains them to go through a scene under water lasting from 45 seconds to a minute and a half. A series of such scenes, put together, make a short movie and when viewed on the screen, it looks as though the actors remained under water for 10 or 15 minutes. All performers must be able to swim at least 60 feet under water.

The props, of course, are weighted down with lead, or nailed down and the job of setting up props for one scene sometimes takes several days. The cameraman goes down with the

Below: This is the underwater wedding. Now that the preacher wears a frock coat but no pants. After the wedding the couple took a honeymoon trip to the surface for fresh air.

Movies Underwater

actors except that he goes down in a steel tank 4 feet square and 7 feet deep. The top is open and one section is made of glass. The camera itself is about 2 feet under water and when the sunlight is strong, the cameraman has no trouble shooting scenes 20 feet below the surface. Most of Newton Perry's pictures are filmed at Silver Springs, Fla., where water conditions are ideal. What makes his subsurface nymphs queens of the deep (they range in age from 16 to 25) are sturdy hearts and lungs and strong physiques.

Perry prefers his sea nymphs young because, he says, they are easier to train and have greater endurance. Holding your breath under water for any considerable length of time is a matter of training. In fact, to hold your breath, act and move your mouth as though you were talking is an art, says Perry.

Queen of the sea nymphs (Perry's leading lady) is pretty Elsie Davis who is shown helping the hero escape from a sunken bus (below).

Above: In this scene from "Neptune's Scholars" the sea nymphs complain of the cold, so Perry puts a shovel of coal in the pot stove. Dry ice was used to give the effect of smoke pouring out of the chimney. Below: Perry is shown testing the safety glass in a bus which sank in 20 feet of water, and from which he staged an escape. In this scene, the door jammed (not called for in the script) but they managed to escape just in time.

Navy Rushes New Coast Air Base

Size of the $13,500,000 Alameda, Calif., air base. Air field at left; supply depot at right.

"CALLING Seattle! Calling Seattle! Hitting headwinds off Cape Mendocino. Gas can't last. We're coming in."

The Navy squadron turns back. The leader's wings waggle and plane after plane banks, bucks the wind for an instant and roars north over the treacherous Oregon coast. Meanwhile, 200 miles farther south, an enemy submarine steals shoreward under cover of fog that blots out its light periscope wake. It lies in wait, and tomorrow it will sink the first merchant vessel that comes through San Francisco's Golden Gate.

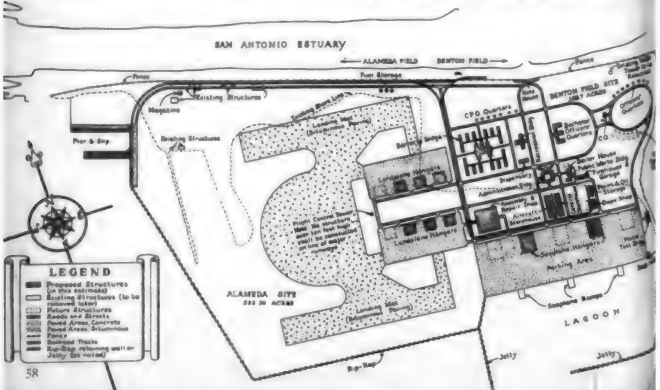
This is the hypothetical situation that gives headaches to Navy officials planning strategy for use in case the country is involved in a Pacific coast war. Navy planes based at Seattle and San Diego must patrol the entire coast including the important San Francisco region, commercial crossroads for California. And this is one reason why the Navy has been granted an appropriation for a Naval Air station at Alameda, Calif.

Navy's engineers, under supervision of Commander E. C. Seibert, have already started work on the new air base and by the time the job is finished (about 1942), 14,000,000 cubic yards of new land, two square miles in surface, will have been scooped from the bottom of the bay. Added to Benton Field, old Army base, and Pan-American airways' Clipper ship base at Alameda airport, it will constitute a huge Naval reservation with hangars, barracks and shops where 10,000 Navy fliers, cadets and enlisted men will ply their trades. At the west end of the base will be docks where six aircraft carriers can tie up and unload their planes.

Behind this titanic job is sound Navy strategy. Both of the present Pacific coast Navy air bases were built in past years before aviation had received the attention it now gets from the high admirals. At Seattle and San Diego, the two bases are widely separated, leaving a 2,000-mile expanse of coastline where the Navy air arm has no adequate supply or training depot. The Alameda base

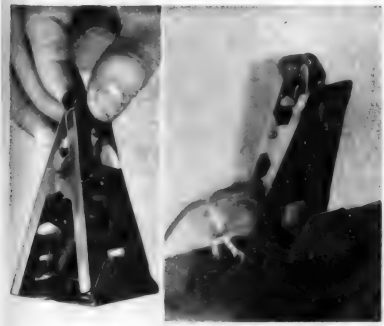
[*Continued on page 127*]

Complete layout of the new air base proposed for San Francisco bay is shown below. Ten thousand men will be stationed here for air patrol and defense purposes.



Inflated Tubes Take Place Of Tent Poles

THIS unique tent needs no poles and is easy to transport from place to place and to erect. It covers seven square feet of ground space. The tent is supported by rubber tubes encased in canvas covers, the tubes being detachable and inflated from one point. An ordinary hand pump will raise the tent in three minutes. The rubber tubes are held at their bases by clamps, so that the tent is capable of withstanding a strong gale. The tent is made of eight-ounce duck.

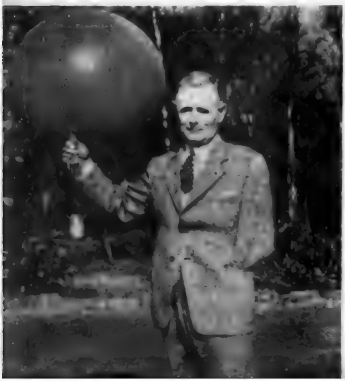


Trap Catches Mice Without Use Of Bait

A NOVEL mousetrap will catch Mr. Mouse without tempting him by bait of any sort. Mr. Mouse has a bad habit of sticking close to the wall during his travels around a room, due to his natural fear of coming out into the open. The trap takes advantage of this weakness. When Mr. Mouse sees the opening of the trap in his path, he will go through it rather than go around it. As he passes through, he trips a very delicate spring, and that is the end of Mr. Mouse.

Radio Robot Guides Traffic

WILLIAM HALSTEAD, Huntington, L. I., inventor, explains to a passing motorist the working of his highway traffic control system, which makes use of the radio robot. An automobile radio tuned to the correct wave length, when approaching the robot box, will pick up the message, "The light will turn red in ten seconds."



Sculptor Carves Tree Statue

LAWRENCE T. STEVENS of South Windsor, Conn., puts the finishing touches on his gigantic statue of a majestic ethereal spirit. This impressive specimen of wood sculpture, carved on an elm tree sixty feet in height, is one of a group of three figures in an exhibit devoted to religion at the New York World's Fair.

Air "Mines" Are Defense Aid

DESIGNED for release at night as a means of defense against enemy bombing planes, a newly developed aerial "mine" (left) consists of a small balloon to which is attached a small bomb. The bomb is fitted with a time fuse which will explode it at a set time if an enemy plane has not bumped into it, thus eliminating the danger of the bomb falling unexploded to the ground to destroy homes or kill friendly ground troops.

Police Motorcycle Has Two-Way Radio

BLUE BESSIE, owned by the Beverly Hills, Calif., Police Department, is believed to be the only motorcycle in existence equipped with a two-way radio. Designed by F. R. Gonsett, chief radio technician for the department, who is shown here with Officer Joe Malpasuto, the five-tube sending unit weighs six pounds and is carried in two compact rack arrangements behind the driver's seat.

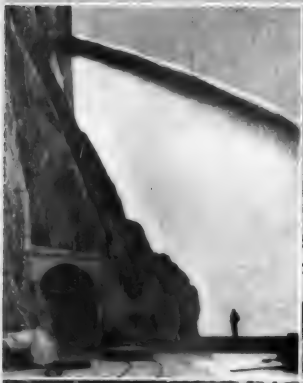
Balloon Marker May Save Lives Of Pilots

MEMBERS of the U. S. Naval Air Base at Floyd Bennett Field, Brooklyn, N. Y., are conducting experiments with a balloon type rescue marker which could be carried in compact form by Navy pilots engaged in over-water flight maneuvers. The deflated balloon is attached to a cartridge in which is contained helium under pressure. This is attached to a band around the pilot's arm. In a forced landing the pilot pulls the cartridge trigger, shooting the balloon aloft.

Easy Chair Designed For Lovers Of Comfort

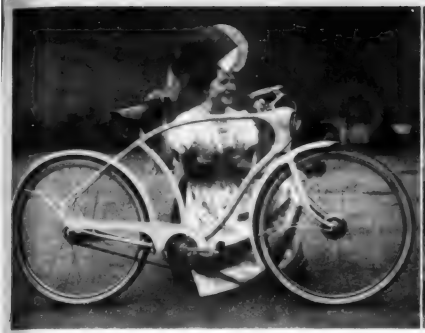
COMFORT-LOVING William Porter of East St. Louis, Ill., has designed an easy chair equipped with 17 accessories. Built from an old bed, the chair contains a built-in radio, bookcase and magazine rack, electric fan, shoe shining and pipe smoking equipment, compartment for food, miniature bar with space for glasses and bottles, plugs for electrical wall sockets and the sockets, and a gear shift device to adjust the chair.

World's Biggest Power House



MEET the champions! The power house in the Nevada wing of Boulder Dam contains the six giants pictured on the left: the biggest electric generators ever made, each capable of an output of 82,500 kilovolt-amperes.

Notice how they dwarf the figure of the man on the ladder, in the foreground. Photo directly above shows satin-smooth shafts of the huge machines, which are driven by Colorado River water, falling 180 feet from dam to river bed—13 feet more than Niagara Falls. Photo in upper left corner shows water discharging from outlet valve after leaving power house. Harnessing of the Colorado River here for irrigation and electric power is regarded as one of the greatest engineering feats of all time.



Streamlined Bicycle Built

A STREAMLINED bicycle was one of the sensations of this year's fair at Basle, Switzerland. Even the headlight is streamlined into the frame. A good idea of how far cycle design has advanced since Grandma was a girl can be gained by comparing this late model with the old high wheeler at the right.

Savings Bank Made Of Glass

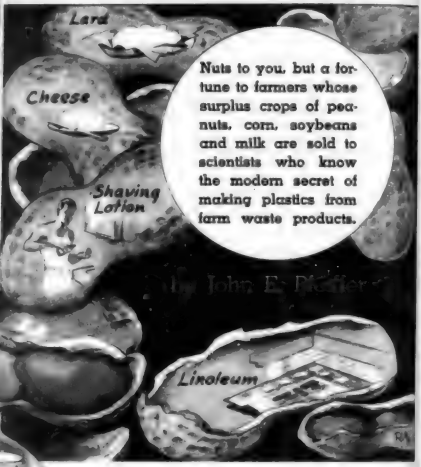
A NOVEL home savings bank should enable either children or adults to lay aside a tidy little sum in coins. Made entirely of glass, it is so constructed that it is impossible to remove coins by shaking. The only way in which the bank can be opened is by breaking it.

Adjustable Map Fits Steering Post

A NEW idea in automobile maps is this one, which has been designed with a roller device to fit on the steering post of the car. It eliminates the inconvenience of folding and the danger of removing eyes from the road for inspection. The map is 14 feet long, and about two inches are visible. The visible surface can be shifted to suit the driver by turning the knob.

Modern Miracle:

Dr. George Washington Carver. He played with peanuts; told farmers and scientists that millions could be made from this prolific herb. He extracted 300 products from peanuts (from lard to ink); never asked for any reward.



Nuts to you, but a fortune to farmers whose surplus crops of peanuts, corn, soybeans and milk are sold to scientists who know the modern secret of making plastics from farm waste products.

THE highly publicized plastics industry is booming sky-high. It astounds laymen with a countless variety of articles from toothbrush handles to automobile parts—all made from materials molded by high-speed presses. Meanwhile, another field in the vast realm of synthetic chemistry is developing slowly but surely. Its growth isn't accompanied by any blowing of trumpets or screaming headlines, but its tremendous scope includes plastics and a host of other chemicals. The new field is called chemurgy—the industrial use of agricultural products—and you might as well learn the word quickly, because indications are that it will play an important part in the

Plastics from Farm Waste

lives of you and your children in the not-too-distant future.

Chemurgy's most important function is to make use of waste farm materials, just as natural-resources experts have extracted thousands of valuable by-products from coal tar, natural gas, and briny water. One of the most farseeing chemurgists is a Negro, George Washington Carver—and his special interest has been peanut shells and surplus peanut crops.

His story begins nearly 80 years ago, when a group of raiders stole two slaves, a 6-month-old boy and his mother, from Moses Carver, a white farmer in Diamond Grove, Missouri. The farmer pursued the criminals, cornered them, and rather than fight offered a $300 broken-down race horse for the baby (the mother was never found). When the child grew up, his industriousness and honesty earned him the name George Washington, and he borrowed his last name from his master. At the age of 18 Carver had finished high school and decided to go to college. The ex-slave's master offered him money, but the boy insisted on making his own way in the world and wouldn't take a cent.

Instead of sending sour milk down the sluiceways, scientists found it excellent for making plastics. Turned out pencils, pens, needles and buckles from it.

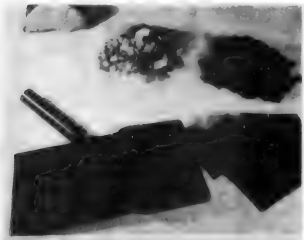
Then George Washington Carver started walking. He slept in old barns and earned his meals doing odd jobs. Finally he reached Indianola, Iowa, where he determined to enter Simpson College. But since he was broke, he had to open a laundry and wash shirts to get money for an education in chemistry and agriculture. Seven years later he had an M.S. degree from Iowa State College (one of his friends there was a young boy, Henry A. Wallace, now United States Secretary of Agriculture) and was soon recognized by the great Negro Booker T. Washington, who invited Carver to take a position at Tuskegee Institute in Alabama—where he has been working ever since. Soon Dr. Carver was telling southern farmers how they could improve their outputs. One way to do this was to grow peanuts and plenty of them, because this crop put nourishing substances back into the soil.

The farmers who followed this advice found themselves with so many extra peanuts that even circuses and other well-known peanut users couldn't take up the entire crop. So one group brought their surplus problems to Dr. Carver. The scientist began experimenting and in a few years he had worked miracles with the humble nuts. From their constituent substances he made over 300 products, in-

cluding cheese, instant coffee, shaving lotions, dyes, lard, linoleum, flour, soap, face powder, ink, and axle grease!

His work, however, only started with peanut shells. He found a way to extract colors from common Alabama clay and his paintings with these pigments (made on peanut-shell paper) were so good that in 1917 he was elected to the Royal Society of Arts in London. Today, largely as result of Dr. Carver's work, peanut growing is a $60,000,000 business.

America's veteran chemurgist has always lived a simple and self-denying life. He wears an old cap and baggy trousers. He won't take a cent for any of his discoveries and they are all public property. Dr. Carver was once offered a $100,000 salary to work in an industrial research laboratory, but he merely smiled and went on creating chemical wonders at Tuskegee. After the Negro chemurgist found a complicated method for making synthetic marble from wood shavings, a manufacturing company, interested in the product, invited him to move to another state and work for them at any price he named. But when Dr. Carver replied that he'd prefer to stay where he was, the company packed up and moved to Alabama, where they obtained his expert advice free of charge. Obviously, the Negro researcher doesn't give a hoot about money. One day he was playing the piano (he was once a concert pianist, and heard that he had lost his life savings—$70,000—in a bank crash. Not even stopping, he smiled and said: "I guess somebody found a use for it. I wasn't using it myself."



Above is a composite picture showing various stages in manufacture of plastic from wood. A section of wood is cut into chips, exploded into black fiber, refined and formed into sheets and pressed into desired shapes that can be either formed or machined.

Although the Tuskegee chemurgist is most famous for his work with peanuts, he has performed many other chemical believe-it-or-nots. He extracted fertilizer, from swamp mud, paint from cow dung, and furniture-beautifying veneers from Florida palmetto roots. He even put some of his paintings in frames made of waste corn husks. In fact, when Dr. Carver was playing with waste corn products he little realized what would result from such test-tube magic. Corn is the United States' No. 1 crop in acreage, output, and value.

United States farmers devote about 100,000,000 acres to corn growing. This means that every year they find themselves with wastes of about 150,000,000 tons of corn stalks, 20,000,000 tons of corncobs, and millions of pounds of husks. When you think of corncobs, you may picture a smelly pipe burned on the inside, but Iowa State chemurgists see things of far greater value and practical application. They ground cobs into a pulp and then gave

This crumbly material (left) is dried soybean. Insert picture shows soybean plant and some of the plastic products made from it for Ford autos.

The Bureau of Dairy Industry, U. S. Dept. of Agriculture demonstrates how adding acid to skim milk makes the curd (casein) separate from the whey. Casein is then converted into fiber (above) that looks like wool, takes dyes and blends with fabrics.

them a four-hour bath in steam-pressure containers filled with caustic soda. Then the remaining mass was beaten into a jelly-like, fiberless substance which hardened into a solid black or brown plastic. The corncob plastic is called Maizolith. Cobs also contain cellulose, the valuable material that is necessary in making Celluloid, Cellophane, cellulose acetate plastics, rayon, paper, and smokeless powder. When this substance is extracted from the waste lumps on a large scale, farmers may have a new and profitable source of income. More than 55 products can be made out of cobs that were once waste—including anesthetics for surgical operations, buttons, dyes, incense, linoleum, tar, and a substitute for rubber.

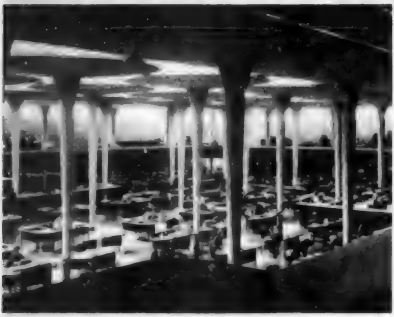
Under the thrift-seeking eye of the chemurgist not a speck of the corn plant goes to waste. Cornstalks supply cellulose as well as special foods for patients with diabetes; corn husks, specially treated, are converted into cloth, upholstering material, paper, and a dozen other products. From the tasty corn grains of surplus crops come more than 60 preparations such as alcohol, pastes, machine and salad oils, paints, salves, and candies. The field of chemurgy is apparently unlimited, and corn is only one of the many farm products being studied.

To a chemurgist milk, for example, is far more than a health-giving food. There are 25,000,000 milk cows in the United States which give about 155,000,000,000 pounds of milk a year. Of this about 50,000,000,000 pounds are skim milk, useless for ordinary drinking purposes. This liquid, with all its rich fats eliminated for butter and other products, still contains about 3 per cent of a protein called casein. Farm-synthetic chemists purposely curdle bossy's skim milk, and from the curds they extract casein in the form of tiny white granules that look like bread crumbs. These bits of matter can be pressed together and molded to give a milk plastic. The dairy beverage may also be worked into regular paper or a transparent variety resembling Cellophane.

Milk miracles, however, have only begun. Chemists have discovered a way to turn casein into fibers that make a fabric a great deal like wool. The average cow's annual milk yield of 4,000 pounds can be turned into 100 pounds of the wool substitute. The juggling of the molecules in milk has become so skillful that a group of conservative scientists forgot their restraint at a recent meeting of the American Chemical Society, and chortled optimistically of a milky future:

"Soon you will be crawling out from under blankets made of milk. . . . You will turn on a faucet handle of milk to take your morning shower. . . . Then you will don a suit of warm milk wool, held in place by buttons of milk. . . . When you climb into your automobile, you will turn on the milk ignition knob, and your hand will grip the knob made of milk on the gearshift lever. Upon arriving at the office,

[*Continued on page* 118]



Glass Tubes Light Modern Building

THE picture above shows not a scale model of an architect's dream but the actual ultra-modern office building of a firm in Racine, Wis., the only one of its kind in the world. At the left is a view of the main work room. Windowless, the building is heated through the floor and lighted through 43 miles of glass tubing and skylights. The twin turret-shaped structures on its roof are the "nostrils" by which it "breathes."

Swiss Guard Roads With Steel Girders

THE Swiss are getting ready just in case! These studs have been placed in the roadways leading up to the German frontier between Lake Constance and Basle. Spaced at intervals of twenty kilometers, the roads can be closed immediately by pressing an electric button in a hidden "pillbox," which causes the steel girders to shoot up from the roadway. The studs can be connected with barbed wire, making a barrier that is impenetrable by advancing infantry and even strong enough to offer effective resistance to artillery and tanks.

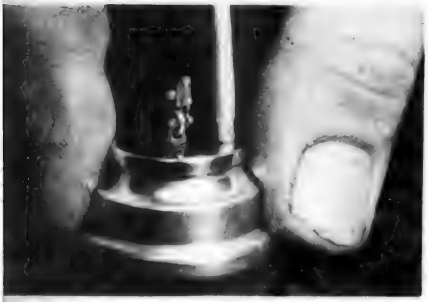
Speedboat Smashes Five Marks

Above: Emancipator VII is shown, shooting over the water in her record smashing performance. Left: The pilot's cockpit as seen from the rear. Below: A glimpse of her powerful engine.

SKIMMING over 162 miles of water in his 225-class hydroplane Emancipator VII, S. Mortimer Auerbach broke or established the following five records: The 24-mile mark in the four-litre class with a speed of 62.0991 miles per hour, the unlimited 24-mile record, the unlimited one-hour mark with a speed of 62.20 miles per hour, the one-hour four-litre record, and the three-hour record, which he established with an average speed of 54 miles per hour.

Speedboat To Seek New World Record

EDWARD SPURR, a 31-year-old Englishman, built this new speedboat to compete against Sir Malcolm Campbell and Count Theo Rossi in a needle match for the world's title. He calls it the Empire Day II. This "skimboat" is designed to skim over the top of the water like a flat stone. One of its features is the W-type engine. Spurr is confident that his Empire Day II will set up a new world record on Lake Windermere this summer.



Tiny Steam Engine Fits In .22 Shell

A STEAM engine so tiny it can be concealed in a .22 caliber short cartridge was built by Sophus Johnson of Rhinelander, Wis. It stands $\frac{1}{4}$ of an inch high, has a bore of .046 inch and a 3/64 inch stroke. The engine will run on 15 pounds compressed air power per square inch and has taken 100 pounds. At the higher pressure it attains an estimated speed of 20,000 revolutions per minute.

Invention Of Mitt Changed Baseball

JOSEPH GUNSON, retired Philadelphia policeman, holds up the catcher's mitt he invented in 1888, while playing with the Kansas City Blues. His idea revolutionized the game, yet he received no money and little credit for it. Before adoption of the mitt, the catcher stood behind the plate only on third strikes or with men on base. With him playing so far back, short bunts were encouraged, because they usually went for base hits.

Amplifier Aids Plant Guides

A TRACTOR concern originated the above idea for giving visitors a comprehensive picture of the company's plant. Finding that the words of their guides often couldn't be heard because of factory noises, the company developed this portable amplifier. The complete equipment weighs 15 pounds, five of which, in batteries, rest on each hip of the wearer. The speaker permits instructions to visitors, yet directs its sound so as to avoid disturbing men at work. Strapped across the chest, the amplifier gives its wearer freedom of both arms. It has a variable volume control. One guide can now handle 20 people.

Ancient Bones In Instrument

THE bonaphone, above, is ten million years old, if you take it piece by piece. It is built of several fossilized rib bones of the prehistoric rhinoceros which used to roam the Nebraska plains. Thousands of bones were tested for pitch and resonance, and when two full octaves were obtained, the pieces were shellacked and tied in position as keys.

Receding Wing Tips Cut Landing Speed

THESE receding wing tips permit safe landing of planes at the slow speed of 20 miles an hour and eliminate dangerous lateral sway. They are the invention of Charles Laurent, a French aviator.

How to Build SECTION

BUILD THE MI SPITFIRE

Model racing automobiles, powered by small gas engines provide a spectacular and thrilling sport as they roar around the track at speeds up to 45 m.p.h. Get in on the ground floor of this exciting new hobby by building this little racer.

by
Herbert Lozier

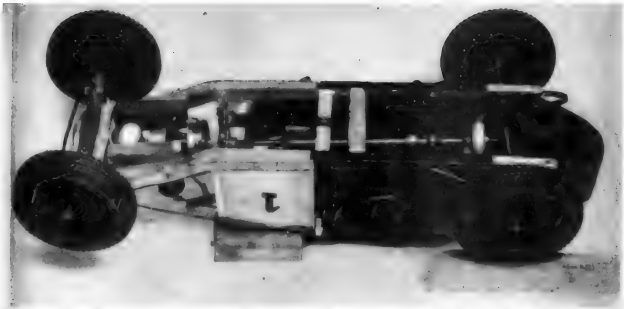
MINIATURE racing cars are becoming extremely popular with model fans everywhere. Model makers have been building and running them for a year or more, and report that they have everything the enthusiast could wish for; namely, speed, ease of construction, and detail. So favorable have the reports been that MECHANIX ILLUSTRATED presents in this issue plans for a car which has many advancements over the older types.

The MI Spitfire differs from these models in that it is larger and uses a different kind of chassis, being underslung, instead of overhung. This lowers the center of gravity and prevents the car from tipping over in a tight turn. Another advantage is the elimination of the nuisance of having to remove the seat or other parts to get at the battery, coil, condenser, or any part of the wiring system.

You will notice that the construction has been kept as simple as possible so that anyone familiar with airplane or gas-powered speed boats will have little trouble building the racer. However, before you go into the actual construction you should remember that racing car models are not toys. They must be carefully built and taken care of. You must use a good motor and above all do not become discouraged if it does not work perfectly as soon as it is finished. Most models need some adjustments before they can function at maximum efficiency.

The car is designed for any ⅛ horsepower gasoline motor and employs a simple, highly efficient friction drive to transmit the power to the rear wheels.

The entire chassis frame construction is of wood and the fittings, with one exception, are



Inverted view shows alignment of drive shaft. An old metal radio dial and rubber friction disc form the differential, providing a simple but effective method of transmitting power to the rear wheels. Rubber tube serves to couple drive and motor shafts.

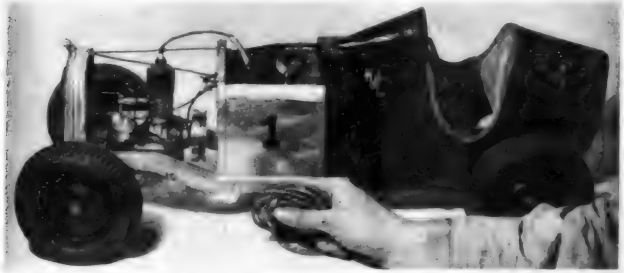
standard radio accessories throughout. These fittings are inexpensive to buy and easily obtainable. The one exception noted covers the front axle, which is taken from an Erector set and being a standardized part, is quite easily obtained. ⅛-in. round (R.H.) or flat (F.H.) head machine screws are employed throughout as bolts.

The body sheeting on the original car is made from heavyweight cardboard but light metal can be substituted if desired. The templates provided for the cardboard body (see Fig. 6, p. 92) may be used for constructing the body from metal.

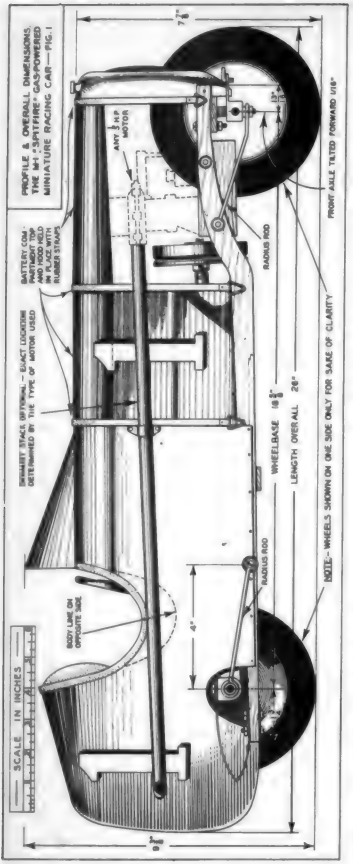
Finally, the wheels are of extremely ingenious construction and employ 5½-in. tires as sold by most cigar stores or auto accessories houses. These small facsimile tires cost 15 cents apiece and the complete set of wheels should not cost more than a dollar.

Building The Model

First study the plans and construction drawings thoroughly. This will give you a picture of the general disposition of the main parts and facilitate later reference to individual details. Actual construction starts with the chassis frame and the first step is



A ½ horsepower Brown Jr. motor gave the original *Spitfire* a speed of better than 40 miles per hour. Power in the rear wheels was sufficient to cause a tire to burn through the varnish of a ruler held against it. Nose cord by which car is guided.



Reality of appearance is shown by this profile drawing. Soft longitudinal springs at the rear, and coil springs over the front wheels make *Spitfire* ride like the McCoy. Exhaust stack is optional.

Engine is started like an outboard by winding a string around the grooved flywheel, then giving it a sudden yank. Battery and condenser wiring is the same as in a model plane. Aluminum firewall protects the car from damage by fire in case of an accident.

therefore to get out all the wooden parts needed. Various parts are shown in pattern form and arranged in their general location in the drawings, Fig. 3, p. 88.

Cut the side pieces of the frame from straight-grained hardwood following the layout given and using special care when drilling the required holes. These holes must be drilled accurately to insure correct line-up of the chassis. Cut out the other members of the frame and drill where specified. The radiator shell and the bulkheads may also be cut out at this time and laid aside until they are needed. These items are not assembled until the chassis frame is entirely completed and both axles in place as shown in Fig. 4, p. 89.

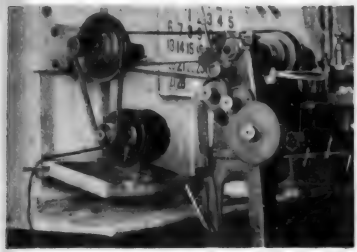
Make the motor mount blocks and drill the holes for the side bolts but leave the holes for mounting the motor until it is time to install the motor. The actual size of the blocks will vary to suit the type of motor used. The dimensions as given are designed to take the ½ h.p. Brown Jr. motor.

With all wooden pieces cut out, the assembly of the chassis frame may be attended to. Carry it to the point shown in the perspective drawing (Fig. 3) and then turn to the metal fittings.

The rear axle assembly and rear springs are handled first. Figures 4 and 5 pps. 89-91 show all the details of this construction as well as the four wheels which may also be made at this time. The drawings covering these parts and their assembly are so detailed that little more can be said beyond relating the order of assembly.

[*Continued on page* 87]

SHOP KINKS



An Efficient Lathe Hookup

IF YOU purchase a lathe built for overhead shafting you can solve the hookup problem by setting the fixture on the wall behind the lathe and hanging an electric motor on the wall below the pulley. Mount the motor on a piece of two by ten and connect this to the wall with four screw-eyes, two in the block and two in the wall. A dowel stick completes the hinge.

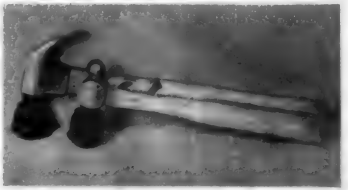
This hookup assures a tight belt because the weight of the motor provides the tension.—*Walt Messenger.*

Wax Coating Protects And Lubricates Saw Blade

TO PREVENT rust from attacking a saw blade it may be given a liberal coating of paste type floor wax. Apply the wax generously with a soft cloth, spreading it evenly over the whole surface of the blade on both sides. This has the advantage over grease or oil in that it need not be removed before using the saw. The wax also tends to lubricate and cool the saw blade.—*Howard R. Heydorf.*

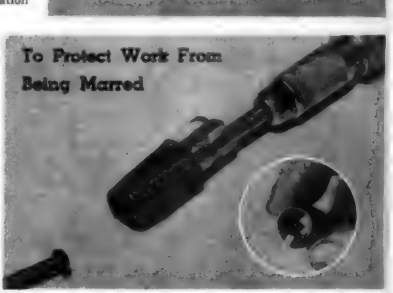
An Improvised Rubber Mallet

A RUBBER crutch tip removed from a cane or camera tripod slipped onto the business end of a claw or ball-pien hammer makes an excellent rubber mallet. The standard size crutch tip obtainable in five and ten cent stores will fit the regulation hammers snugly.—*A. Traufer.*



To Protect Work From Being Marred

FREQUENTLY, when working with a spiral ratchet screwdriver the tool slips from the screw, marring the surface of the work or inflicting a cut in one's hand. To prevent this a non-slip guard may be made from a 2-inch length of small pipe. A small flat spring, which provides the friction necessary to hold the pipe in place, is bent so one end goes down inside the pipe and the other end is soldered to the outside of the pipe. An inch length of rubber tubing, slipped over bottom end of pipe and extending $\frac{1}{16}$-inch over the edge of pipe protects work.—*B. Nielsen.*



A BARBECUE IS FUN

by Hi Sibley

THE barbecue or garden fireplace has become so popular that soon every family will consider it as necessary a part of the home as a garage. It is a great boon to the women particularly as it makes entertaining much easier—and more fun—than indoors. And it's much more economical, too.

This type of fireplace has not become standardized, each family selecting a design—or creating one—that fits in with their own needs and arrangement of the garden. Herewith are presented four widely different types in drawings, and several others in photographs. The drawing, Fig. 1, page 93, gives the general principles of construction—which are; a chimney high enough to carry fumes away and clear the surrounding shrubbery, a grate bar, a grill for broiling and a hot plate to lay over this for cooking hamburgers, flapjacks,

Deluxe barbecue in sunny California. Palm thatched roof makes outdoor dining comfortable in all weathers.

A barbecue fireplace with gas and electricity as well as a wood-burning grate. Note lamp on chimney and electric outlet at right.

and the like. With these essentials, any style of barbecue should be successful.

Fig. 1 illustrates one of the most complete and convenient barbecue fireplaces it is possible to build. In addition to the above mentioned items, it can be equipped with asbestos-lined fire doors which add to the comfort of the chef when a hot fire is going. There is a sink with running water, a plug-in outlet for electric utensils such as waffle-iron, toaster; a gas outlet for other utensils; gas burner in the firebox for use when a hotter fire is not needed, or a sketchy bit of cooking is in order. This burner consists of a single pipe with perforations pointing in at an angle so that the jets are directed toward the grill (see photo, left). A warming oven is provided in one wing. This is a sheet metal box with the end against the firebox from which it derives its warmth. In some outdoor fireplaces

No stoop, no squat outdoor oven built into the patio, or backyard, depending upon what part of the country you live in. Most barbecues can be built inexpensively, materials such as stones being gathered.

Brick oven built up against the side of the house. Firebrick is recommended for this type, and is cheaper in the long run because it will last indefinitely unaffected by the hottest fire.

an oven from a discarded gas stove is simply cemented into the structure.

Note that the grill or broiler and grate bars rest upon angle irons bolted into the cement, or rather the bolts are cemented between the bricks. With this arrangement the grill and grate can be lifted off for repairs or for substitution of hot plate.

This particular fireplace is lined with fire-brick, which is a good idea for all fireplaces if the plan permits, as it is far superior to common brick or stone when exposed to a hot fire.

The enjoyment of meals in the open, and the tastiness of food cooked over an open fire will more than repay the effort and slight expense of building a barbecue.

Fig. 2 shows a very simple design, and if second-hand brick are available, it will cost very little. Note that an incinerator is incorporated in the back, a very handy arrangement, a fire wall of firebrick separating the two compartments, but both being served by the single chimney.

A departure from the foregoing types is shown in Fig. 3, which has a large, boxlike opening serving the double purpose of fire-box and barbecue hot-plate. For cooking flapjacks and other dishes which require a hot plate, a fire is built *beneath* the box through the door at the side. When steaks are to be broiled, a charcoal fire is made *on* the hotplate, and the grill is located just above it. This fireplace also has a good sized incinerator in the back.

The small barbecue in Fig. 4 is simply a brick box or pit built against a wall or chimney, and equipped with a grill and door for

[*Continued on page* 119—*drawing on page* 93]

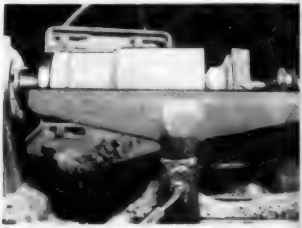
LATHE-TURNED

THE home shop fan who turns his machines to frequent profitable use will find sales possibilities in this very popular project. Requiring but little wood and a small square of sheet copper, the boxes can be turned out quite rapidly. They will sell readily in many retail outlets such as drug stores, gift shops, on cigar counters and in department stores. Another angle is to take orders from friends and acquaintances, thus putting the difference between the manufacturing cost and the full retail price in your own pocket.

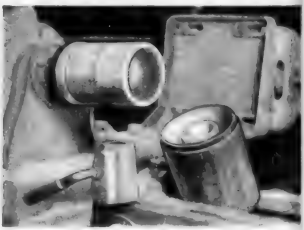
Access to a metal turning lathe will permit you to turn the deep boxes with thin, straight sides neatly and with dispatch. Allow a little waste on the bottom of the stock, which should be about 3½-in. in diameter (or square) to start and about 5-in. long. Fasten the stock to the large face plate with longer than usual

The hardwood box with copper top holds 40 cigarettes and plenty of matches in compartment. Design is very compact.

Inside turning can be done on a metal turning lathe with wood lathe parting tool in tool post after handle is removed.



Box is removed from the jig on which it was supported for the outside turning and sanding. It is now ready for lacquering.



The box is placed over the jig in the wood lathe and the waste at the bottom neatly turned off to get rid of all screw holes.

BOX FOR "SMOKES" by Dale Van Horn

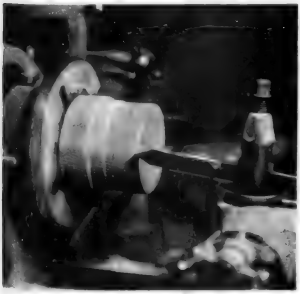
wood screws to insure solidity, since they are turned into the end grain.

The parting chisel was used in the tool post on the metal lathe for the inside cutting—the wood handle being easily removed for the purpose. The inside was turned to the dimensions shown, which gives a match recess just deep enough for the matches in penny boxes. If you would rather use kitchen matches make the match compartment correspondingly deeper. A box of these dimensions will accommodate 40 cigarettes and about 1½ boxes of penny matches.

After turning the inside, sand well with sandpaper wrapped about a dowel. Move it in and out with the lathe turning at a fairly good speed.

Fasten a block of wood to the wood lathe face plate and turn a jig which is very slightly tapered so that the box—still unturned on the outside—can be shaped. For best results, bring up the dead center against a small wood block between it and the box bottom.

First turn off the bottom waste to get rid of the screw holes and bring the box to an overall length of 3¼-in. Then turn the outside straight to 3¼-in. in diameter as indicated. Sand smooth, coat with filler (if you use walnut or other coarse grained wood) and finish with a coat of clear lacquer laid on so liberally with the brush that slow turning by hand is necessary for 3 or 4 minutes to prevent running. This insures a thick glossy coat. When dry, rub down with No. 000 steel wool, then wax.



Forming block for the copper or aluminum lid must be turned down to the same diameter as the inside of the lid is to be.

With the metal lid square in place, back-up block is brought firmly against it to prevent buckling when edges are turned.

After waste is cut away, the back-up block is removed and the lid polished to a high lustre with number 000 steel wool.

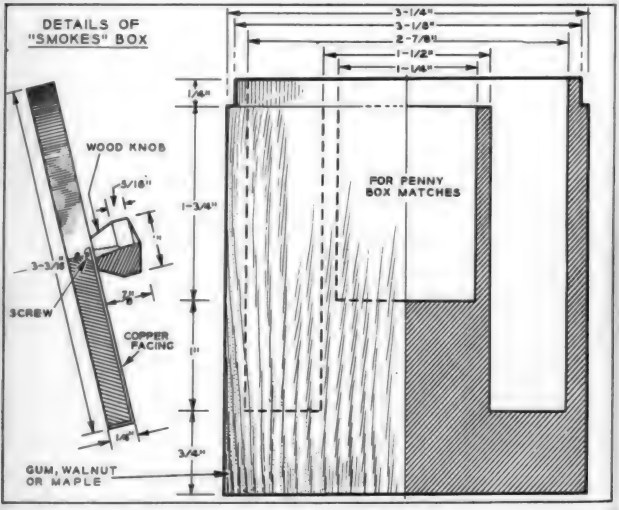
The copper lid is merely spun over a hardwood block turned to a size slightly more than the extreme top of the box to give a fairly loose fit. To prevent mishaps, cut the medium weight copper into a 4-in. square and drill the center. Put a screw through this hole into the

This barrel design will appeal to many and can be made in the same manner as the straight-sided box. The hoops are darkened by friction, with the lathe turning at high speed.

center of the hardwood block. Turn another small round block to the same diameter as the *outside* diameter of the lid is to be and countersink the center of each side. Bring up the dead center in one and let the other countersunk hole fit over the screw head which holds the copper in place. This backing up block prevents the copper from springing out of line when the lid is being spun.

For best results, use a ½-in. steel ball bearing welded to a short¼ by ½-in. iron bar for spinning these lids. The bar is held in the tool post firmly. Then the protruding portions of the copper are liberally wiped with grease to prevent cutting and the lathe started at slowest speed. The ball is used to force the copper over the shoulder. After about ⅜-in., the copper will break through. Cut off the waste with a sharpened file tang so the lid is ¼-in. high. Now back away the tail stock, remove the back up block and with the lathe turning at medium high speed, polish the copper with steel wool. Wipe with a cloth soaked in strong soda water to remove traces of grease and when dry, spread on clear

[*Continued on page* 119]



Electric Fan Cleans Walls

A SMALL, inexpensive electric fan can be made into an excellent wall cleaner. After removing the blade and guard, punch a hole in the center of a shoe polish tin lid and slip it on the shaft, fastening it with the same nut that held the fan. Cut a disc of sponge rubber and force it into the lid. Turn on the motor, holding the rotating rubber disc against the wall, and watch it erase dirt and stains.—*A. H. Waychoff.*

Removing Wheels From Grinder Shaft

TO TAKE off one of the abrasive wheels from the shaft of a motor driven grinder it is necessary to keep the shaft from turning as the retaining nut is loosened. In the event that the nut is very tight, as it should be, the plier grip on the unyielding surface of the wheel may crack or chip it. The possibility of such injury can be entirely eliminated by using the little jig shown, which consists of a length of strap metal bent into a U shape and having a strip of thick rubber or felt glued to the inner surface. Slip this device over the wheel rim and grip it with the pliers instead of the hard wheel surface.—*W. C. Wilhite.*

Spring Opens Pliers Automatically

A LENGTH of ordinary screen door spring slipped over the tips of your plier handles proves a boon when working in tight or awkward places where it is difficult to shift the pliers. A spring which will fit snugly should be chosen; the ends cut off to receive the handles.—*B. Nielsen.*

Soap Eases Removal Of Varnish Can Caps

THE caps on varnish, liquid wax, and shellac containers usually become adhered to the can in the intervals between use. A liberal coating of soap applied to the spout of the can will not only prevent sticking but will insure an airtight joint.—*H. R. Heydorf.*

Build "AQUASCOOTER"

A Sailing Surfboard

If the young lady sailing *Aquascooter* seems familiar to you, it's probably because she's Olivia de Havilland, Warner Bros. star. Guess you'll have to whistle for a breeze, Olivia!

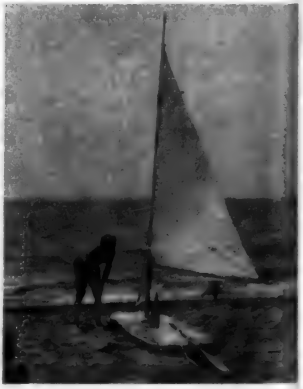
by Roland E. Hill

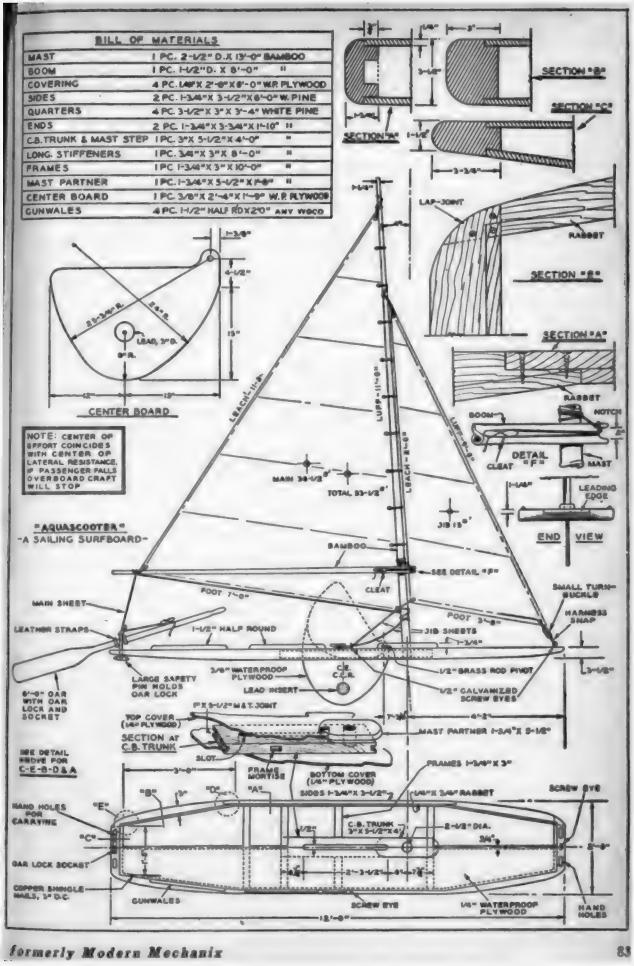
AQUASCOOTER is an evolution of the "paddleboard," now so popular on beaches everywhere. The design is the result of a summer of experiments, so don't change it or you may have trouble. The oar is necessary to bring it about. The centerboard is pivoted to ride over life-lines and allow it to sail up onto the beach. Other peculiarities are also necessary. There are no sharp projections to tear bathing suits or skin.

Have every piece, except covering, cut out and every joint fitted before assembling. First make the two side members. Cut mortises in them ¾-in. deep to receive the tenons on the transverse 1¾x3-in. members. Have the rabbets cut at the mill, if possible, likewise the rabbets on the top only, of the quarters. The bottom and end rabbets must be cut with a rabbeting plane, as they are curved or returned.

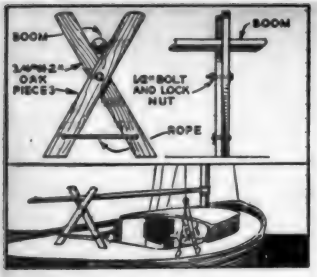
The four quarter pieces are next and are the hardest to make. Lay out the curve as seen from above on one of these pieces first

[*Continued on page 126*]




BILL OF MATERIALS
MAST 1 PC. 2-1/2" D.X 13'-0" BAMBOO
BOOM 1 PC. 1-1/2" D. X 8'-0" "
COVERING 4 PC. 1/4" X 2'-6" X 6'-0" W.P. PLYWOOD
SIDES 2 PC. 1-3/4" X 3-1/2" X 6'-0" W. PINE
QUARTERS 4 PC. 3-1/2" X 3" X 3'-4" WHITE PINE
ENDS 2 PC. 1-3/4" X 3-3/4" X 1'-10" "
C.B. TRUNK & MAST STEP 1 PC. 3" X 5-1/2" X 4'-0" "
LONG. STIFFENERS 1 PC. 3/4" X 3" X 8'-0" "
FRAMES 1 PC 1-3/4" X 3" X 10'-0" "
MAST PARTNER 1 PC. 1-3/4" X 5-1/2" X 1'-8" "
CENTER BOARD 1 PC. 3/8" X 2'-4" X 1'-9" W.P. PLYWOOD
GUNWALES 4 PC. 1-1/2" HALF RD X 2'-0" ANY WOOD
SECTION "B"
SECTION "C"
SECTION "A"
LAP-JOINT
RABBET
SECTION "E"
SECTION "A"
RABBET
BOOM
NOTCH
DETAIL "F"
CLEAT
MAST
LEADING EDGE
END VIEW
CENTER BOARD
LEAD, 3" D.
NOTE: CENTER OF EFFORT COINCIDES WITH CENTER OF LATERAL RESISTANCE. IF PASSENGER FALLS OVERBOARD CRAFT WILL STOP
LEACH-11'-8"
LUFF-11'-0"
LEACH-8'-0"
MAIN 38-1/2"
TOTAL 53-1/2"
JIB 13"
"AQUASCOOTER"
-A SAILING SURFBOARD-
BAMBOO
SEE DETAIL "F"
CLEAT
FOOT 7'-0"
FOOT 3'-8"
MAIN SHEET
LEATHER STRAPS
1-1/2" HALF ROUND
JIB SHEETS
SMALL TURN-BUCKLE
HARNESS SNAP
LARGE SAFETY PIN HOLDS OAR LOCK
3/8" WATERPROOF PLYWOOD
LEAD INSERT
C.E. C.C.R.
1/2" BRASS ROD PIVOT
1/2" GALVANIZED SCREW EYES
6'-0" OAR WITH OAR LOCK AND SOCKET
1" X 5-1/2" M & T. JOINT
TOP COVER (1/4" PLYWOOD)
SECTION AT C.B. TRUNK
MAST PARTNER 1-3/4" X 5-1/2"
SEE DETAIL ABOVE FOR C-E-B-D & A
SLOT
FRAME MORTISE
BOTTOM COVER (1/4" PLYWOOD)
SIDES 1-3/4" X 3-1/2"
FRAMES 1-3/4" X 3"
1/4" X 3/4" RABBET
SCREW EYE
HAND HOLES FOR CARRYING
C.B. TRUNK 3" X 5-1/2" X 4'
2-1/2" DIA.
OAR LOCK SOCKET
COPPER SHINGLE NAILS, 3" D.C.
GUNWALES
SCREW EYE
1/4" WATERPROOF PLYWOOD
HAND HOLES
12'-0"

Nautical

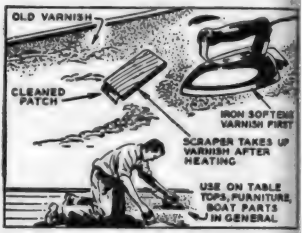


Home-Made Folding Boom Crutch

INSTEAD of supporting your boom when the mainsail is furled by means of the peak halliard, try this simple boom crutch. Cut two pieces of ¾-in. oak about 2-in. wide and long enough to reach when criss-crossed from the deck to just above the normal boom level. Clamp the two pieces together and drill a half inch hole from 8 to 12-in. from one end—the thinner the boom the closer to the end it may be. Fasten with a bolt, using washers and a lock nut. At the foot end drill a small hole in each leg and run a 3 foot length of light manila rope from one to the other. This allows the legs to spread just the right distance, and permits easy folding and stowing of the crutch when not in use. Many large boats have permanently attached boom rests, but for the small sailboats, the above arrangement is ideal.—*Roland Cueva.*

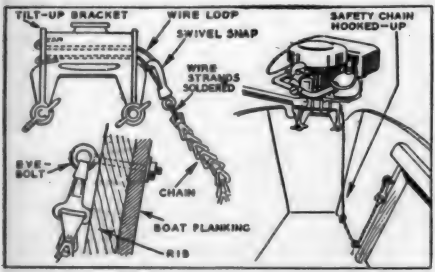
Ironing Off Old Varnish

OLD varnish can be literally ironed off any flat surface on a boat or furniture preparatory to refinishing. Place a heated electric iron on the surface to be cleaned, leaving it in one place just long enough to loosen the film of varnish. Work with the iron in one hand and follow along with a hand scraper in the other, merely scraping off the varnish curled up and loosened by the iron. This is as effective and easier than paint remover.—*J. Emmett.*



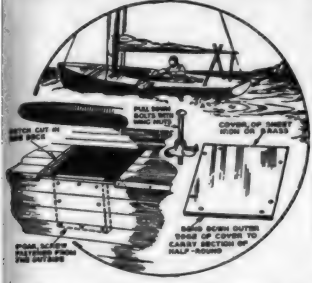
Safety Chain For Outboards

WHEN a submerged object is struck by the outboard motor there is always danger that the motor may be jarred off and lost overboard, especially from old, none too sound boats. The safety chain shown here is quickly attached or detached from either boat or engine, and is made from a piece of light, strong chain about 24 inches long, fitted with two harness snaps, as shown. One of the snaps should be of the swivel type to prevent kinks in the chain. In use, one end of the chain is snapped to an eye-bolt fastened to the boat, and the other to a steel wire loop in the tilt-up bracket, or other convenient place on the motor.—*Roy S. MacNeill.*



Knacks For Yachtsmen

Side Mounting For Motor

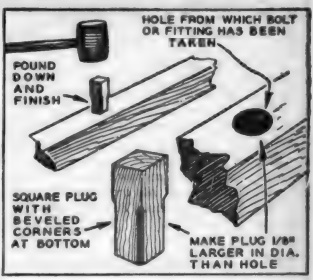


WHEN the height and shape of the transom or rudder complicates using an outboard motor in the usual position, cutting a hatch in the side deck may solve your problem. Cut this between two deck beams making it only large enough to permit lowering the motor, with its hold-on clamps locked in the side position, down over the planking. Reinforce the latter by screw-fastening from the outside a piece of 1-in. oak large enough to fit between two side frames, just below the exposed deck stringer.

When the motor is removed, a piece of brass or sheet iron large enough to overlap the hatch by 1-in. is dropped into place. Bolts with round heads and wing nuts go through holes in cover and deck.—*J. E.*

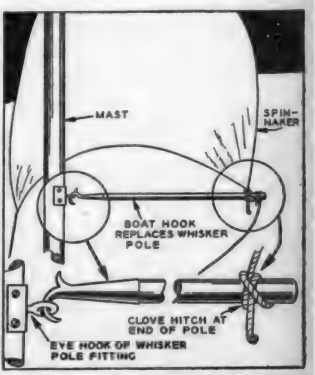
Boat Hook For Whisker Pole

SHOULD your whisker pole (spar that hooks onto side of mast and holds spinnaker) become lost or broken an ordinary boat hook will serve as a temporary substitute. Slip the metal end of the boat hook into the regular whisker pole fitting and fasten the spinnaker to the other end with a clove hitch. Hoist spinnaker and sheet home as usual. In the absence of a spinnaker, your regular working jib can be made to do spinnaker duty by means of the boat hook. In this case hook the metal end through the jib clew grommet and butt the other end against bow eyebolt. Clew (outer) end of this arrangement must, of course, be sheeted down forward.—*R. C.*



Square Pegs In Round Holes

WHEN it becomes necessary to remove the fastenings from the hardwood timbers of a boat in making alterations, the holes left by this operation should always be plugged to prevent rot from starting. The simplest method of doing this is to use a plug of clear pine or other soft wood. Do not attempt to round it, but make it square. This causes the sharp corners to be compressed when they are driven into the hole, making the plug that much tighter.—*Robert P. Graham.*

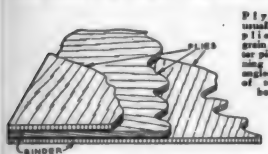


Use WATERPROOF PLYWOOD

In Boat Building

by Sam Rabl

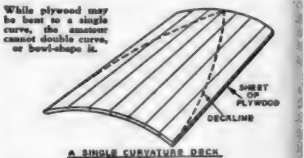
PLYWOOD is being more and more frequently specified for many different purposes in plans of all types of boats. Whether or not it is specified as waterproof plywood, this variety alone must be used. The common type of plywood used in building construction is not at all suitable for boat construction, and many an amateur builder has found to his great sorrow that after many hours of patient work his creation fell apart when afloat a few hours. The common type



of plywood sold for building work is no different in appearance from most waterproof plywoods. Both are faced with fir and to all appearances are identical. The secret lies in the glue. Most building plywoods are either bound with common hot glue or blood albumen glue. Of the two the blood albumen is the better but this is not entirely waterproof. Do not be fooled by a small sample. Most small samples can be thoroughly soaked and the expansion of the layers is so slight that separation does not occur. The unscrupulous dealer will exclaim, "there, I told you so, there is perfect bond between the plies." Try a sample at least eighteen by thirty-six inches immersed in water a minimum of one day for each ply thick. It should be placed in water entirely unprotected by paint or varnish. If it stands this test for several days without the plies separating or buckling, then it is truly waterproof.

True waterproof plywood is put together with what is termed a phenolic resin binder. Many different manufacturers use different methods of securing the bond but the phenolic resin is the best waterproof binder. Just what is phenolic resin? It has the same base as bakelite, phenol fiber, micarta or other materials of this type. Many manufacturers even spray the outer layers of their product with this substance, which is colorless and gives a waterproof surface to their product. True waterproof plywood will even stand steam bending and ¼-in. stock can be steam bent to a radius as small as eight inches without harm. Some of the plywoods use Douglas Fir, or Oregon Pine as their material, facing it with redwood, mahogany or other woods that present a more pleasing appearance than fir. Other plywoods are made with poplar or chestnut cores of thick wood and faced with outer layers of a more expensive wood such as teak, walnut and rosewood. This type will not find its way in to a boat except in the form of expensive joinerwork.

All good plywood is at least fifty per cent stronger than any natural wood of the same thickness. It is constructed of three or more alternate layers of wood with the grain of each at right angles to its neighbor. This eliminates expansion of the cross grain, it being checked by the firm bond to its neighbor, whose grain is longitudinal. Where long narrow pieces of plywood are used, the outer layers should be of longitudinal and not transverse grain. This to a great measure checks



warping. Plywood will find a lot of use in hull planking and decking, but even though it is absolutely waterproof, the ordinary precautions taken with any wood for its preservation should be observed. Where any amount of double curvature is present plywood should never be used. Double curvature simply means that curvature exists the length of the surface as well as across it. If you are not sure that a surface can be planked with plywood, try this test. If a thin piece of cardboard can be laid entirely on the surface without the edges puckering then any type of plywood can be used. Where it is used on any curved surface

[*Continued on page 128*]

BUILD THE MI SPITFIRE

[Continued from page 74]

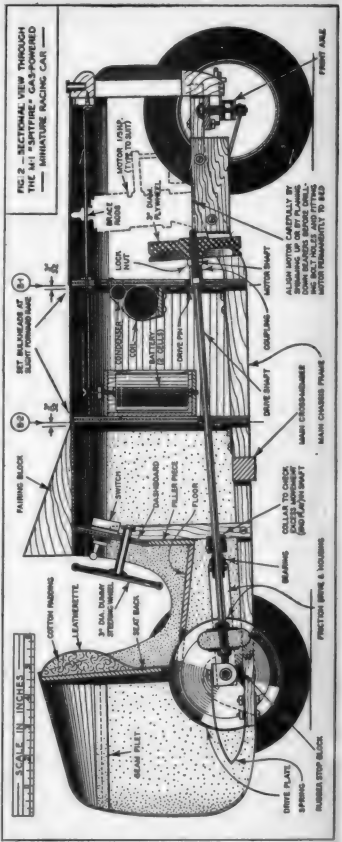
Make the springs and spring saddles as shown in Fig. 4 and lay them aside until the drive frame and rear axle are completed. In making the drive frame great care should be taken to insure accurate line-up of the three holes. The bearing hole must be absolutely centered and the two holes for the axle housings lined up properly. It is a good plan to drill these after the frame has been bent, placing a wooden block between the frame during the operation and drilling clear through frame and block.

After the frame is drilled and the two housings slipped into place and brazed fast, make the rear axle. ¼-in. brass rod is used here. Thread each end as shown and then slip the axle through the housing tubes and test the alignment. Place a plain washer and nut on each end of the axle and take up tight on the nuts. The axle should turn freely and with the least possible end play. When this is attained with the nuts fully tightened the axle may be removed and the drive shaft fitted.

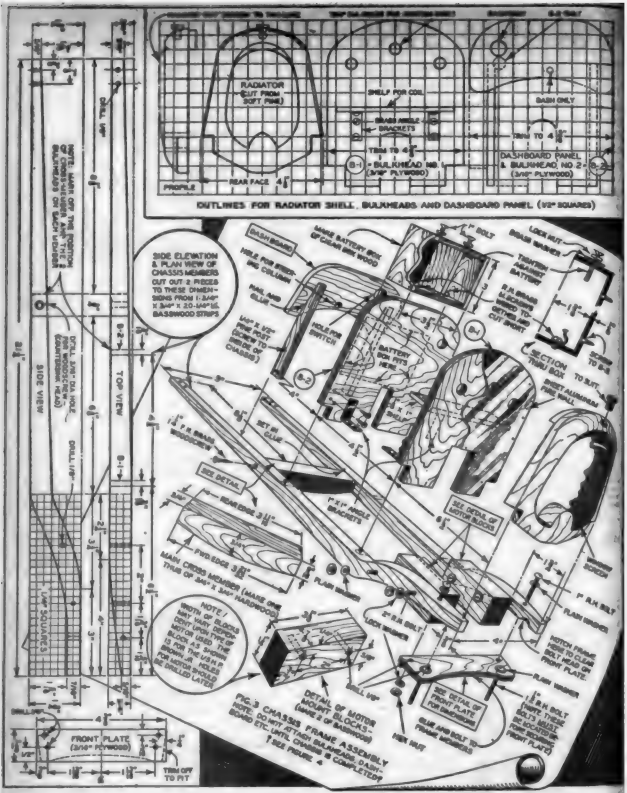
The drive shaft may be of ¼-in. brass rod as shown or even ⅛-in. brass tubing. Whichever is used, thread one end as shown and slip the shaft through the bearing which you have previously installed. Assemble the rubber friction disc or washer as shown and slip a small collar or radio dial pulley onto the shaft outside the frame. This collar checks end play during the final adjustment of the gear.

Now take the rear axle again and slip it into place, but this time interpose the large drive plate shown in the plan view, Fig. 5. Put on the axle washers and nuts, tighten up as before and then force the drive plate against the smaller friction disc. Holding it tight against the disc proceed to spot the axle through the set screw hole in the hub of the drive plate so that the axle can be drilled at this point and a cotter pin later inserted through hub and axle to hold the drive plate in the desired position. Sufficient contact between the drive discs must be obtained to insure non-slip drive. The axle is then removed, drilled and is ready for the final assembly.

In reassembling don't forget to add the large washer and the spacer tube as shown in the plan view, Fig. 5. This spacer tube must be cut and filed to a careful fit so that the axle neither binds nor tends to show noticeable side-play when the end nuts are tightened up fast. An easy working fit should be aimed at for all moving parts and this is doubly important in the rear axle assembly.



The car "split down the middle." Body can be constructed either of cardboard with sheet metal bonnet, or all metal.



With drive frame and gear completed the unit can be assembled to the springs and frame. Slip the spring saddles into place after first putting in the ½-in. bolts which secure the saddles to the springs. This entire assembly is clearly shown in the detail sketch, Fig. 4. Bolt the springs fast to the chassis members and glue a small rubber pad or block directly under each axle housing.

Make the rear radius rods and slip one end over the axle housings, the other end being attached to the chassis by means of woodscrew and washer as shown. The rear end of the chassis is now complete with the exception of the wheels.

Next make the motor coupling. It may be as shown in the detail sketch Fig. 4, or simply a small length of stiff rubber hose forced onto the drive shaft and motor shaft will serve. This latter coupling has the great advantage of being ultra-

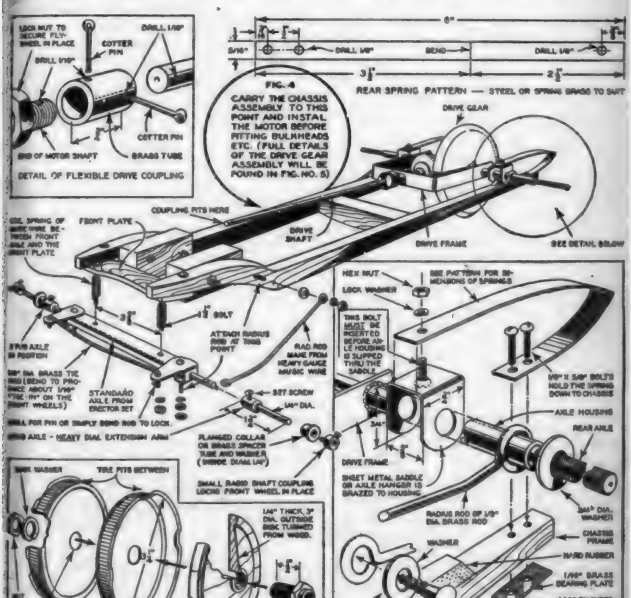
...ible as well as extremely flexible and durable.

Now take the motor you have selected and equip it with a grooved flywheel. A 3-in. diameter flywheel is recommended for smooth running. The vee-groove is to facilitate starting by means of a string which is wound around the grooved portion of the flywheel and pulled sharply to start the motor. Bolt the flywheel securely in place and give the motor a thorough check up and test run preparatory to installing.

Now set the motor in place on the blocks and check the line-up with the drive shaft. While it need not be exactly in line, the closer you can get the alignment the better it will be. The flexible coupling permits some leeway here. If the blocks need shaving down in any way to improve the line-up now is the time to do it.

Place the motor in its final position and drill through the blocks for the motor mount bolts. These bolts should go clear through the block using lock washers and nuts to secure them. This is better than merely screwing the motor down to the bed as is often done in model airplane mountings.

Attach the coupling decided on and test the shaft for rigidity. Only one bearing, that on the drive frame, is provided for in the plans but a supplementary bearing can be added later just aft of bulkhead No. 1 if excessive vibration develops in the shaft. However, if your line-up



Complete chassis, drive shaft and friction gear assembly are shown above. Front axle is a standard part from an Erector set. Spoke wheels are made from jar caps assembled as indicated and fitted with rubber tires, such as may be obtained in a five-and-ten cent store.

is good and your workmanship up to par the single bearing will prove adequate.

Now fit the front axle. It is sprung with light coil springs and braced with radius rods as shown. The front axle should be tilted up at the front about 1/16-in. and the tie-rod bent to produce about 1/16-in. toe-in on the front wheels. The complete assembly is shown in Fig. 4. Note how the stub axles are lengthened by means of radio dial extension arms and that the axle is put in with the steering knuckles facing forward to permit easy adjustment. The Erector axle comes complete with steering knuckles and is obtainable direct from A. C. Gilbert & Co., the makers, if your local department store does not carry this item.

The four wheels can now be made. They are so simple that little need be said other than to point out the necessity for having the hub holes in the jar tops centered exactly. The entire assembly is shown in Fig. 4 and a cross-section through the wheel will be found in Fig. 5. When the wheels are completed run each one on a ¼-in. shaft and correct them for balance by the adroit use of a few drops of solder.

Front wheels run freely and are secured to the stub axles by small brass collars which are secured to the shaft by set screws. Rear wheels are locked tight against the axle lock nuts (nut marked "B" in plain view, Fig. 5) by means of lock washers and nuts.

The chassis is now complete and the bulkheads and other framing should be assembled. See that the center of each bulkhead is cut out to clear the drive shaft and fit the battery box and coil shelf at this time. Hook up the wiring in the usual manner, running the switch wire clear back to a small toggle switch mounted on the dashboard. A dummy but turnable steering wheel is easily made from the drawings, (see Fig. 6) and the steering column pressed into a tight fit in the hole indicated on the dash layout (Fig. 3, pattern, top of page 88).

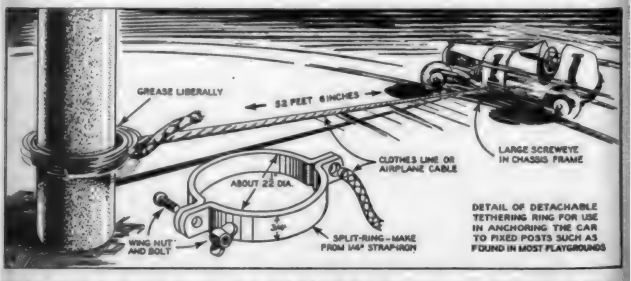
It is a good plan to give the mechanism a test at this time, before adding the body and finishing details. The chassis can be locked in a vise during this test run.

The body can be made, as already noted, from cardboard or sheet metal. The former is adequate and much easier to work. Nail and glue all joints between cardboard and wood; glue all joints between cardboard and cardboard. If metal is used a paper pattern should be made from the squared pattern provided in Fig. 6 and a very careful fitting made before attempting to cut the metal itself. All metal to metal joints will of course be soldered while metal to wood joint may be either small flat headed screws or nails.

The battery compartment sides are of sheet aluminum or tin and the hood, which runs in one piece from the radiator clear over the battery compartment is of similar material but is detachable for inspection purposes. It is held down by three straps made from heavy flat rubber binders terminating in small wire clips which hook under the chassis.

The fairing block or streamlining ahead of the driver's seat may be solid wood as shown or shaped from sheet metal. It is purely for appearance and the construction employed is not important.

After the main body work has been completed, add the seat back and fit a seat or flooring piece over the drive gear. These pieces will have to be cut out where needed to clear the large drive plate. Wood or cardboard will do for these pieces. Cover the seat back and the seat opening with leather and paint the car to suit. A bright red goes well with the aluminum hood. The radiator should be finished in aluminum and the wheel centers in gloss black. No exhaust stack is necessary but appearance is served by the addition of this item. The actual fitting must depend upon the type of motor used so no details for attaching the stack can be given here. The stack should be made from a length of ⅜-in. or ½-in. nickel brass



Car is allowed to run in a circle around a pole to which it is held by a free swinging cord. Official tracks are 105 feet in diameter and ⅛ mile in circumference. Races are usually run with an eight lap qualifying round and a four lap final heat.

tubing and it need be attached to the body at one point only with a simple metal strip loop. Pivoting to the motor must be worked out by the builder.

Now you can hook up the coil, condenser and batteries. Do it the same way you would on a plane, and check all wires, especially those leading from the switch. When you are sure all is ready, put some gas in the tank, place the car in a vise. Make sure that the rear wheels are clear of all obstacles, and try her out. Be sure when starting the engine to turn the flywheel the correct way (counter-clockwise), for those not familiar with rotors may become twisted.

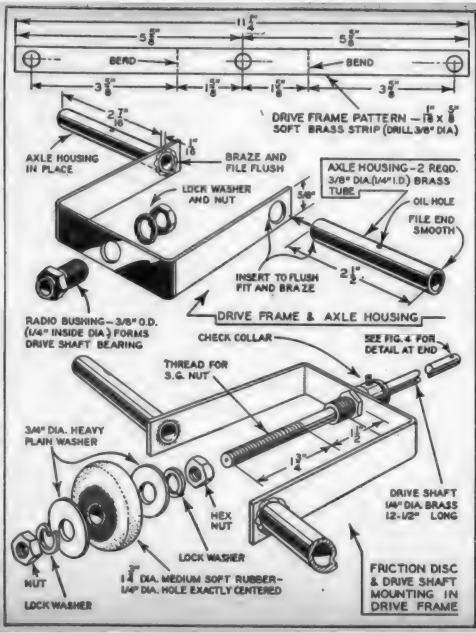
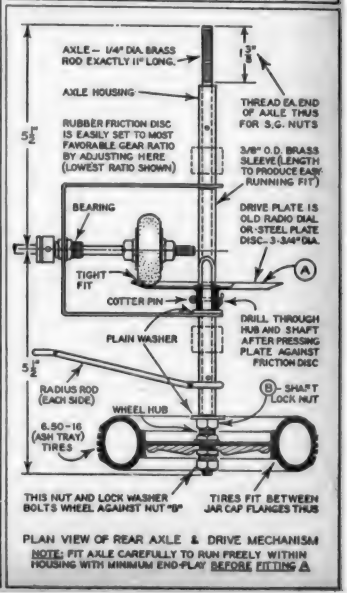


FIG. 5 — DRIVE FRAME & GEAR CONSTRUCTION



PLAN VIEW OF REAR AXLE & DRIVE MECHANISM

NOTE: FIT AXLE CAREFULLY TO RUN FREELY WITHIN HOUSING WITH MINIMUM END-PLAY BEFORE FITTING A

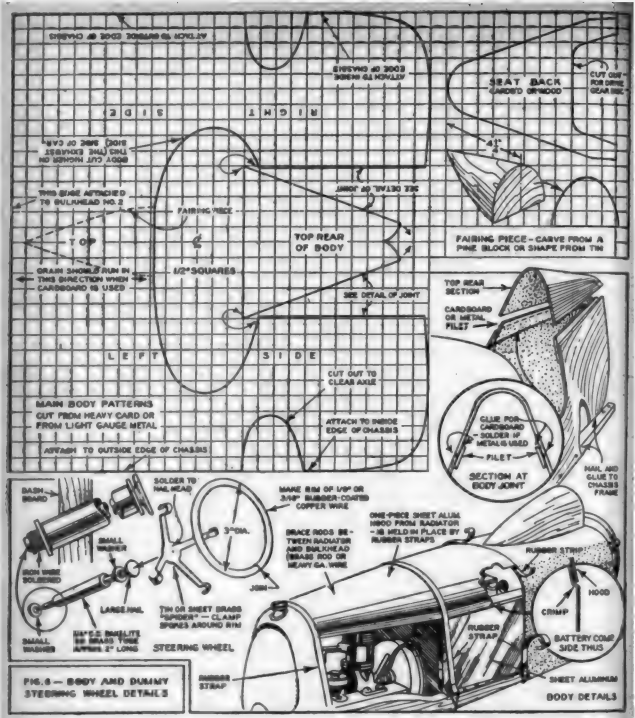


FIG. 6 — BODY AND DUMMY STEERING WHEEL DETAILS

Make all the final adjustments and learn the tricks of your car before you take her out, for she's bound to develop some. Then place a screw-eye in the mid section of the chassis, tie a good strong cord to it and set the wheels in a wide circle. Make sure that the nuts on the steering-knuckles are tight. Choose a clear smooth place, set her down gently, after she is wound up, and let her go! You will be in for a thrill. Remember, however, that any highly accurate piece of machinery develops trouble now and then if not properly adjusted. If you will have patience and give your model a chance, you may get a prize-winning racer out of it.

MIDGET RACING CAR BLUEPRINTS!

Although you can successfully build the "Spitfire" from the drawings in this magazine, a set of genuine FULL-SIZED blueprints will make the job faster and more fun, as you can build your model right on top of them. Address Fawcett Publications, Inc., Greenwich, Conn., enclosing postal or express money order. DO NOT send cash through the mail.

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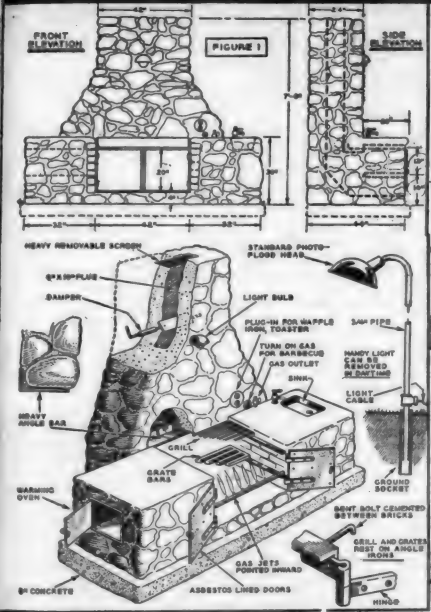
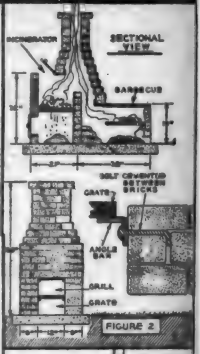
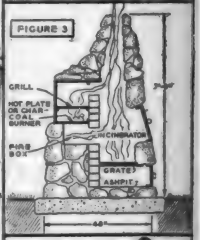
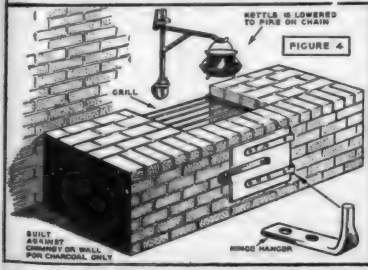
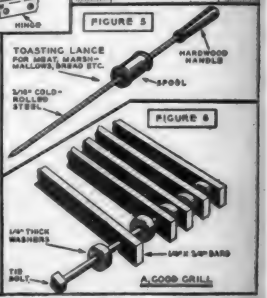
Plans For Barbecue Fireplaces







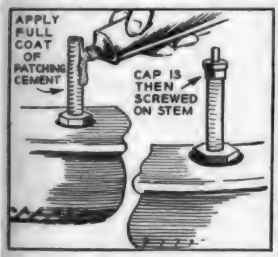




KINKS FOR CAR OWNERS

Block Helps Remove Stubborn Wheel Nut

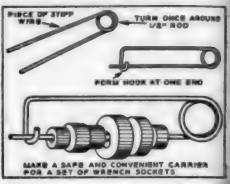
QUITE often the motorist, when caught with a flat along the road far from a service station, finds that the wheel nuts have rusted or jammed on so hard that he cannot remove them with the small crank-type wrench usually provided in the tool kit. To increase the leverage of the wrench, use a block of wood to hold it in a horizontal position. This will enable one to stand on the handle of the wrench with the other foot applying pressure to the center grip, as shown above and thus start even the most stubborn nut. —*Vernon Tracey.*



Rubber Cement Mends Valve

IF A tire valve starts leaking, it's usually because the core has given way. Until you get a new one, you can keep the valve airtight by liberally applying rubber cement to the stem and then screwing the cap back on. This seals the threads so no air can escape.

Easily Made Holder For Auto Socket Wrenches



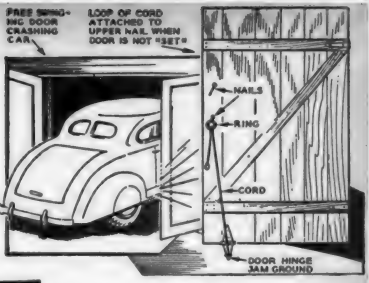
THOSE tired of having to dump out their tool boxes every time they need the socket wrench will find the above holder for the wrench sockets a useful gadget. Bend the holder from stiff wire somewhat in the form of a safety pin, as shown. It should measure about six inches long by two inches deep.—*A. H. W.*

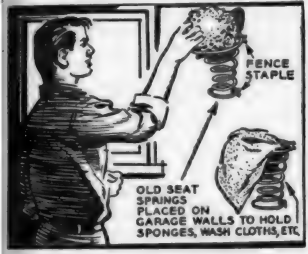
Creeper Light Aids Under Car

MOST persons doing their own repairing have some sort of creeper for getting under the car, and will find this idea very useful. Instead of having the usual drop cord and lamp lying about under the car, mount a porcelain wall socket at the head of the creeper, with a length of wire ample to reach the socket. When you get under the car screw a bulb into the socket, and light will always be where it does the most good. Coming from back of your head as shown, it will illuminate the entire underside of the car, and arms while working will not cast a shadow.—*A. H. Waychoff.*

Hinge Acts As Garage Door Stop

AN ORDINARY good-sized hinge will effectively prevent a garage door from slamming and banging, with the attendant danger of damage to the car when going in or out. Install the hinge as shown at right, in such a manner that when the door is pushed in the direction it closes, the hinge will jam into the ground, stopping it instantly. A cord or chain fastened to the ground end of the hinge permits raising it to close the door.—*J. Ford.*



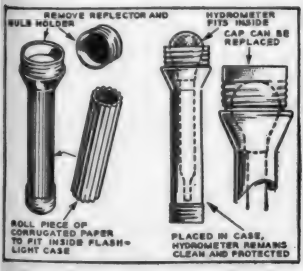


Racks From Old Seat Springs

A FEW old automobile seat springs fastened to the garage walls by means of staples make handy repositories for dust and washing cloths, sponges, chamois, etc. The springs not only keep these articles within easy reach at all times, but permit air to circulate through them.—*A. H. Waychoff.*

Case Holds Hydrometer

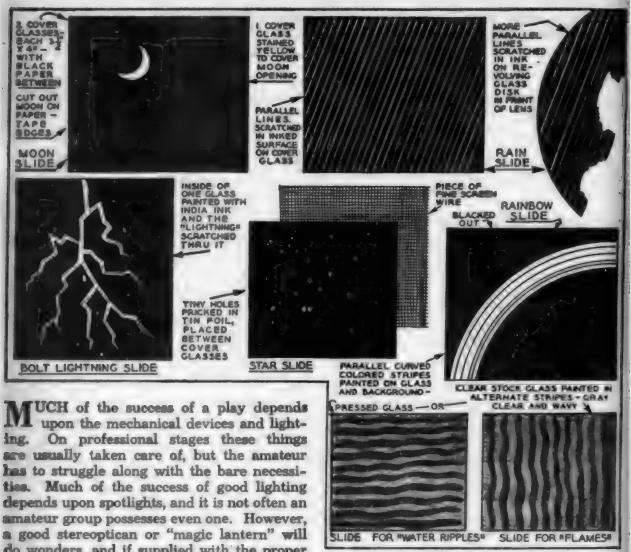
AN OLD flashlight case makes an excellent container for your hydrometer. Place the hydrometer in the corrugated paper-lined case and screw the lens cap back on (without the glass).—*A. H. Waychoff.*



A Unique Battery Filler

THE above illustration shows an unusual method of putting distilled water into storage batteries not easily accessible. Blowing down one tube forces the water out of the other. The glass tubing can be obtained from a drug store and bent to the desired shape over any gas burner.—*Ivan J. Stretten.*

TRICK LIGHTING EFFECTS



MUCH of the success of a play depends upon the mechanical devices and lighting. On professional stages these things are usually taken care of, but the amateur has to struggle along with the bare necessities. Much of the success of good lighting depends upon spotlights, and it is not often an amateur group possesses even one. However, a good stereoptican or "magic lantern" will do wonders, and if supplied with the proper slides, many novel effects can be produced, including some that seem almost unbelievable.

When possible use a stereoptican of not less than 500 watts. The lens should be one providing a beam of at least fifty feet which will cover the entire stage. If possible use two lenses; one a long focus and the other a short focus. This allows the lantern to be used either back in the balcony or close up, perhaps behind the proscenium arch or a set piece front stage.

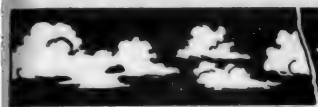
Most modern stages use a cyclorama for sky effects and distance. A cyclorama is essentially nothing more than a flat drop curtain or wall at the very rear of the stage and lighted from overhead or from the sides with floodlights to give it the proper color. Its top and ends are, of course, masked by the overhead borders and the wings.

Several effects that can be produced upon such a "cyke" are shown in the sketches. This of course with a darkened house and stage lights arranged to suit the scene.

First is the moon. This effect is accomplished by making a slide composed of two coverglasses (clear glass) the standard size—3¼x4 inches. Cut out a piece of black paper the same size, and near the center cut a moon shaped opening with a razor blade or sharp knife, making clean edges. Place this between the two pieces of glass and bind together as you would any lantern slide. If the moon is to be yellow insert a piece of yellow celluloid over the opening before binding, or stain the glass itself. Insert in the slide holder and focus sharply on the background. If the sky is lighted a deep blue to represent night, the moon image will cut into it very realistically. By laying the lantern partly on its side and moving the slide holder slowly

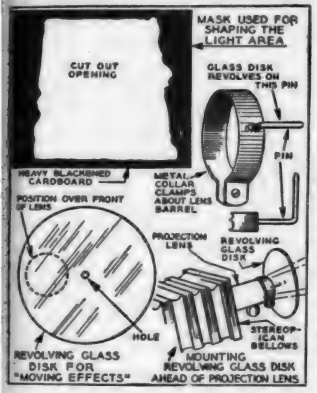
FOR AMATEUR PLAYS

BY L. B. ROBBINS



SEVERAL POSITIVE FILM PRINTS OF CLOUDS CEMENTED TOGETHER—END TO END—AND THEN ALL SURFACE BLACKED OUT WITH INDIA INK EXCEPT THE CLOUDS

MOVING CLOUD STRIP



and carefully, the moon will appear to travel up and across the sky as in nature.

Suppose the stage is nearly pitch dark for a thunder storm. Forked lightning can be produced as follows: Paint the inside surface of one glass with India ink. Then, with a sharp needle, scratch the lightning through the ink to the glass so it appears transparent as in the sketch. Bind the other glass over this and your slide is done. Set the lantern on its side so the slide holder goes in vertically. Project the lightning on the dark drop and cover the lens with your hand. To make the flash move the open fingers across the lens a couple of times rapidly and then cover it again. This will produce a flickering flash following which a stage hand can shake the "thunder sheet." It is enough to startle any audience.

Stars can be simulated as follows: Cut a piece of heavy tinfoil the slide size. Prick it full of tiny holes with a fine needle. Bind it between two cover glasses and project it upon the night sky. They can be made to twinkle by gently moving a piece of fine mesh window screen back and forth in front of the slide.

On a semi-darkened stage a rain storm can be simulated very effectively in the following manner. First have a glass disk cut out about three times the diameter of the projector lens. A small hole should be drilled in the exact center. Swab the disk with black ink or black paint on one side. Next, make a metal collar, like that in the drawing, to fasten securely about the projector lens barrel. A stiff wire shaft can then be soldered to one side of the collar as shown. Prepare a slide by covering with black paint or ink and then scratch fine parallel lines in the paint with a needle. Scratch similar lines in the black on the disk. Place the slide in the holder and the disk on the pin shaft. Slanting rain lines will show on the scenery, and by revolving the disk to the left, from the top, those lines will cross the stationary ones presenting the effect of shimmering, falling rain.

A rainbow can be produced in a startling way by scribing an arc on a clear glass slide and painting the various rainbow colors in this space in narrow strips. Black the rest of the slide. When thrown upon the scene it is advisable to have the image slightly out of focus to get the soft effect of a rainbow.

Two effects, often times desirable, are "water ripples" and moving flames. The surprising part is the simplicity of the things needed to obtain such effects. Have two pieces of pressed glass with wavy, parallel lines pressed in, cut to slide size. Also two disks of the same material cut and drilled like that for the rain. In the "water ripple slide" the lines should lie parallel to the 4-in. side while in the "flame" slide the lines run from top to bottom. Stain the water ripple disk light blue and the fire disk flame red. When the blue disk is rotated in front of the ripple

[*Continued on page 128*]

COINS OF ADVENTURE

Left: French medal of the 17th century, picturing Cardinal Richelieu. Below: Coin bearing likenesses of Henry IV and Marie de Medici.

by Montgomery Mulford

COINS are an accurate archaeological record, and some have played a most important part in determining the ages and dates of various areas excavated or uncovered. Today coin collecting, known as numismatics, has become truly one of the Great Hobbies. Coins are full of historical significance, and their stories make them doubly entertaining.

The coin collector has two types of coins which are of intensive and extensive interest. There are those which record contemporary times, and those which commemorate past deeds or events.

By collecting, and then studying the coins of an era, and the history behind the coins, we may often observe the rise and fall of governments, the battles and wars—man's inhumanity to man. Such coins are of interest in that they are actual records of the times in which they appear. Thus, by collecting these pieces of money the enthusiast obtains something of a panorama of the story of mankind, which suggest countless adventures, startling history, while giving pleasure in the collecting. Here are the stories behind a few of the outstanding coins:

Henry IV, King of France was murdered, and was succeeded by the nine-year-old boy Louis XIII. Under the circumstances, a Regency was appointed which performed little good for France. As a result the country went from bad to worse under the boy-king, until a hero stepped to the fore with the intention of re-creating the prestige of his country. It was the great and popular Cardinal Richelieu, who saved the French kingdom, gave it a firm foundation, and assured its prolonged strength and prosperity. Looking for coins of the age, we may piece together the story of these hectic times in France. French pieces of money portray Henry IV and Queen Marie de Medici, while there is a French medal showing the likeness of Richelieu who, by the way, figures prominently in many stories, and is well-known for his part in Dumas' "Three Musketeers."

Seleucus, warrior-king of Syria, on one of his coins.

Silver sestertius showing Trajan, Roman emperor.

Coin portraits are contemporary likenesses, hence they are valuable records of the past. Above are the Roman emperors Commodus and Marcus Aurelius (lower).

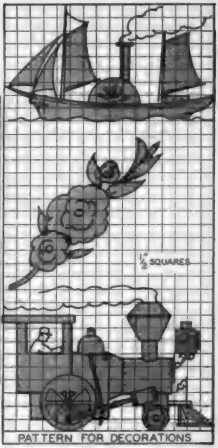
Henry succeeded to the throne in 1589 and was assassinated in 1610. Louis XIII ascended the throne then, to rule until 1643, during which period we find Richelieu as the center of this dramatic stage.

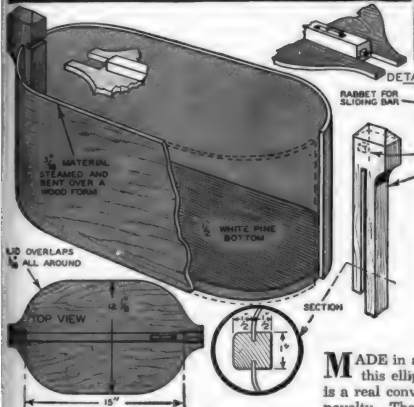
But no matter what era of history is turned to, one will find pieces of money recording it. When Alexander of Macedon, called The Great died, his generals for the most part divided the extensive kingdom amongst themselves. One of these warriors was Seleucus I Nicator, who annexed most of Asia Minor and made it the most important of the states that were carved from the Alexandrian empire. Its first capital was ancient Babylon; then it was moved to Antioch, historic city of Syria. Seleucus Nicator made Antioch one of the most splendid cities of his time, issued coins for the realm, and died. Some of his coins, such as the tetradrachm, portray this energetic warrior-king in the battle helmet of the era.

Later, we find the Roman legions marching over the region, after the Seleucusian kingdom had vanished. Finally, under Trajan, the Roman Empire entered into its Golden Age. You will find Roman coins of various values portraying this famous emperor, the sestertius being among the most common of these. Trajan

[*Continued on page* 129]

Make This Swedish "TINKA" Box





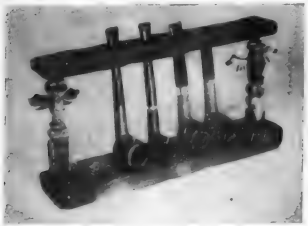
This handsome Swedish traveling box, known as a "Tinka" is made of thin wood steambent, finished in natural grain and decorated with quaint figures. The entire lid comes off, a small sliding catch (top, right in photo) releasing it. The original is in the Durlin Barryton Swedish house, Laguna Beach, California.

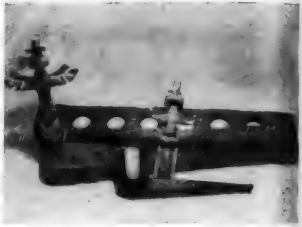
MADE in a wood with an attractive grain this elliptical "Tinka" box for travelers is a real convenience as well as a handsome novelty. The thin side walls are steam-bent over a wooden form made for the purpose, and when they have set, are assembled with the bottom piece and two end posts. Rabbets are made in the latter to receive the ends of the curved sidewalls, and the entire job is assembled with casein glue.

Material for the sidewalls depends upon what is available in the individual locality.

[*Continued on page 129*]

Build A Rustic PIPE RACK





Completed pipe rack at left, and above are the parts before assembly. Ancient finish is attained by "Sugi" (burning) method.

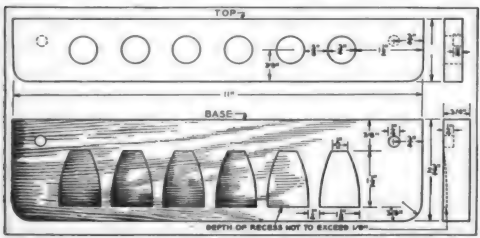
by Hugh L. Martin

GET out the ole' jack knife, you whittlers, and take a stab at carving this unique and interesting addition to the pipe smoker's den. The pipe rack is very colorful and commands the immediate attention of all who have occasion to see it—and you will be mighty proud to exhibit it.

A simple design is presented here to give the woodcarver an idea of how to work. Once started just let your imagination and ingenuity have full reign. There are many unusual and distinctly original designs at which a person may arrive.

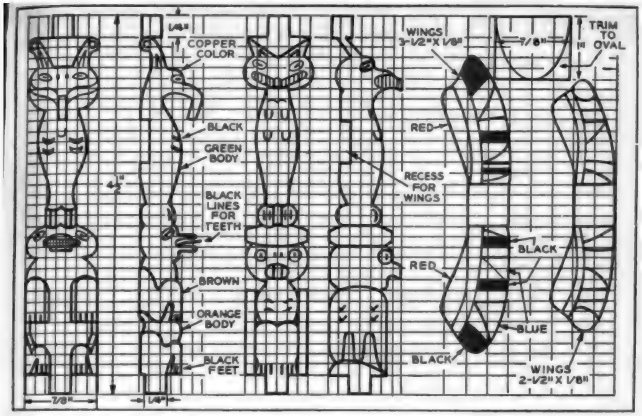
The entire rack may readily be made from white pine, as this wood is very easily worked. For the stock pieces select four straight-grained lengths—two about a foot long, one ¾ by ½-inches to be used for the top, and one a foot long and 2¾ by ¾-inches to be used for the base. Next is to work down the top and the base of the rack to the desired proportions. In working the base it will be found that a small hand gouge will facilitate making the pipe bowl recesses in the base piece. These recesses may be made to fit individual pipes if the worker so desires, thus adding a little more to the personality of the rack. The working of the top is very simple; first shape the stock piece to size, and then locate and drill the holes.

A very striking way to finish the top and the base is to use the Japanese "Sugi" finish. This produces a finish similar to that of aged driftwood. To obtain the "Sugi" finish, place the wood over a flame long enough to char the surface black, being careful to do this as evenly as possible. Also the worker must take care to get the flame well into the recesses in order to make a complete finish. Now remove the wood from the flame and brush with a stiff wire brush over the charred surface, following the direction of the grain in the wood. Brush until the wood comes to a chocolate color and then apply a coat of clear varnish. The varnish will bring out the grain in the wood and make a beautiful surface.



Suggested dimensions are given above, but these can be varied according to individual taste and the number of pipes to be racked.

Now to tackle the most interesting



Thunder Bird and Alaskan Bear totem design is shown above. You may find it fun, however, to use your own ideas and create original figures. At left are the totems, painted with bright oil colors and glued in place.

part of the job—the miniature totem poles. Trim the two stock pieces to half oval sections. Now it is best to sketch with pencil the desired figures in their proportions on the wood; this will help the carver to keep his sizes right. The top figure should be completed before attempting the lower one, or ones, so that there will be no strain on the reduced stick. Use your own procedure in the carving. A suggestion is to rough out the contemplated figure first before trying to finish in any of the small detail work. Do not try to make the job look as though it had been done by a craftsman, but make it look as it would if primitive man had created it with crude tools and a poor conception of correct proportion.

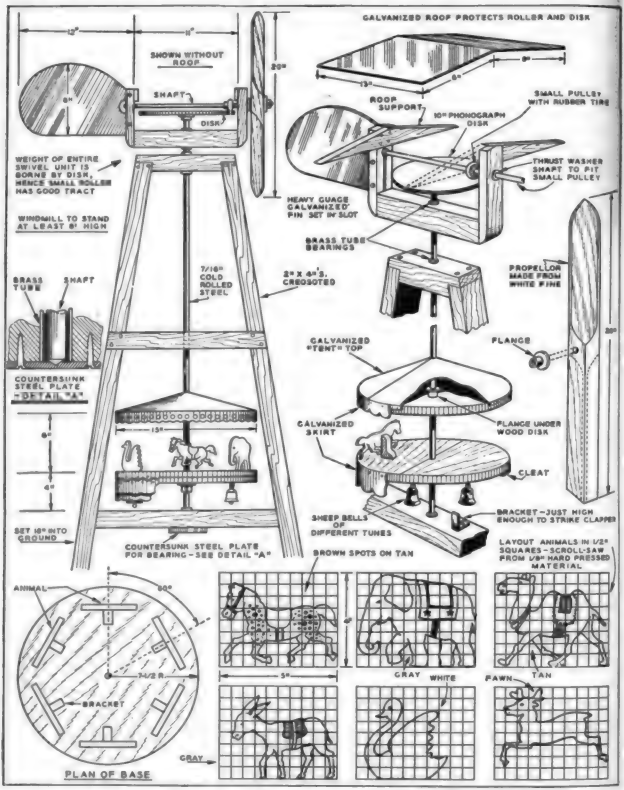
Paint the totems in bright colors: red, yellow, blue, green, and black. Artist's oil paints are the best suited for the purpose. The natural colors of the figure should never be followed. A coat of clear shellac over the completed poles will brighten up the colors and also protect them.

The individual parts now are removed to the assembly line, where the worker can see his masterpiece grow into unity. The pegs of the totems are fitted into the holes in the base and top and glued together and allowed to stand for at least 24 hours to insure a rigid joint.

The totem poles illustrated were inspired by the types created by the Indian tribes of Alaska. The two figures represent the Thunder Bird and the Alaskan Bear. The bird descends from the Eagle and there are many myths written about it. The bear is worshipped by nearly all Northern Indians.

The carver is by no means limited to using only two figures in his totem pole, but may have many, thus increasing the fineness of the work. A few suggestions for making modern poles are to represent in figures: sports, hobbies, or soldiering, but remember, these are just a few. Subjects are unlimited so just get started and let your imagination reign.

WINDMILL "MERRY-GO-CHIMES"



UTILIZING an old phonograph disk and two discarded pieces of shafting this novel merry-go-round with chimes can be built of scrap material. Even without the metal disk a serviceable wood one can be made and trued up on the lathe. The roller should be of small diameter and fitted with a rubber tire, similar to the rings used in sewing machine equipment, or you can shape this part from a piece of scrap rubber. [*Continued on page 128*]

Tools are kept within easy reach on these three inclining shelves with screws, nails, etc., in the drawers below.

Compact Tool Rack

THIS handy tool rack will save time for the home worker who wants to keep his tools within easy reach without having them scattered over his workbench, where they are always in the way. Being very simple, the rack can be easily and quickly constructed.

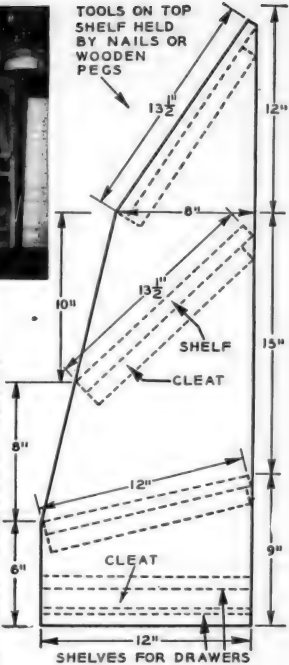
Instead of hanging on the wall, the tools are half lying and half hanging on these inclined shelves. The inclination of the shelves increases the area available for tools, and places the tools within easy reach and in plain view. When you have finished using one tool, you can easily replace it before getting another one, and the tools will always be in place.

The tools on the two top shelves are held in place by nails or wooden pegs. The bottom shelf has a cleat along the front, and the shelf is divided into sections by ½x¾-in. wood strips to hold small tools such as pliers, screw drivers, punches, chisels, etc. On the end of the rack can be placed a drill holder and tools too large to fit on the shelves.

Small drawers, equipped with knobs and labels, are fitted below the bottom shelf to hold nails, screws, bolts, etc. The writer used two sizes of cheese boxes for these drawers.

The length of the rack is to be determined by the length of the workbench and the number of tools. The drawing shows all the other dimensions and the angle at which the shelves are inclined. Each shelf is slanted a little more than the one directly below it in order to give full view of all the tools.—*Arthur S. Clark.*

The larger tools can be kept on the top shelf, with medium sized ones in the middle and smallest at the bottom. This arrangement will be noted in the above photo, and permits one to automatically reach for the desired tool.



FEATURED NEXT

If you liked MECHANIX ILLUSTRATED'S new bigger and better How to Build section which was inaugurated in this issue, be sure to watch for the August number which will contain complete plans and instructions for building *Cinderella*, a beautiful fifty-four-inch sailing model sloop. This is one of the finest models we have ever presented, so boat fans, sharpen up your tools and get ready.

Plans for a sturdy, speedy powered bike with a one-half to one-and-a-half horsepower engine will also be included, as well as an attractive table and bench set.

Also many shorter but equally interesting and useful projects.

DEVELOPING

The hanger, holding the film, is lowered into the tank. It can be lifted out for inspection at any time during development. Above at right: The grooved strips are made by pinching the metal together in a vise. One tank fits inside the other for convenient storage. Slits in the rim hold the film hangers.

by Louis Hochman

AMATEURS who have adapted their 9x12cm. film pack cameras for vest pocket and 2½x3½ film sizes will find this set of film hangers and developing tanks a great time saver.

Designed to accommodate the three film sizes, 9x12cm., 2½x3½, and 1¾x2¾, the hangers afford a means by which a number of films can be developed in one tank, simultaneously, and yet be given individual inspection and care.

Each film slides into a separate hanger and is hung in the tank to develop. It can remain in place for fixing and washing also. In the case of panchromatic film, it is a simple matter to load the film in the hanger in total darkness, by placing two fingers at the openings of the slides to guide the film.

The best materials from which to make these accessories are monel metal and stainless steel. However, a very inexpensive substitute can be found in sheet brass or copper, subsequently nickel plated. The plating will serve to protect the metal and prevent contamination of the solutions.

The hangars are made by folding strips of ¼-in. wide metal in half, longitudinally, to form $\frac{1}{16}$-in. wide grooved strips. The folding can be done by first bending the strips into right angles and then pinching them together in a vise until the ends are $\frac{1}{16}$-in. apart.

These grooved strips are then bent to the shapes necessary to fit the films, as shown in the diagram. A notch is cut at each corner to facilitate bending. The upper ends are then soldered to ½-in. strips of metal, which extend crosswise and project ½-in. past the grooved strips on each side. The projecting ends serve to overlap the mouth of the tank when the film is hung in place to develop. The hangers should be uniformly 5¾-in. long. The grooved strips should project ¼-in. above the cross pieces and be flared open to simplify loading.

The 9-12 cm. hanger will also hold 2½x3½ cut film slid in sideways. Thus, two sizes of hangers take care of three sizes of film.

OUTFIT FOR CUT FILM

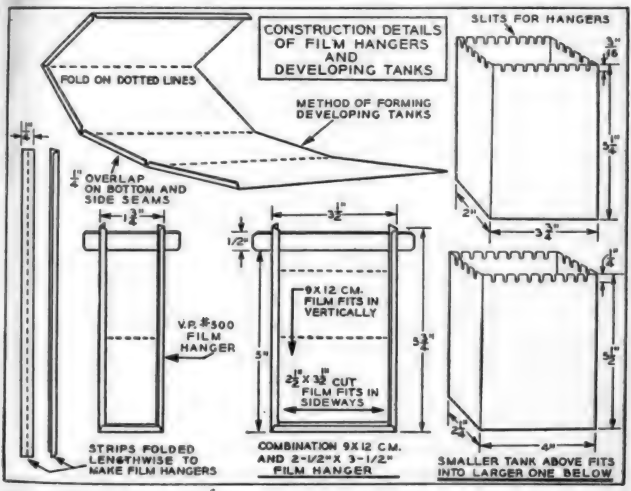
The developing tanks are designed to fit one in the other for convenient storage, two being required. One holds the developer and the other, the short stop bath. When the films have been transferred to the short stop, the developer is poured out of the first tank and hypo poured in. The films are then fixed in this tank.

The tanks are made by cutting the sides out of one piece of sheet metal, leaving a ¼-in. flap on the bottom and side seams. After bending the sides as shown, the seam is soldered together by tinning the outer side of the flap and the inner edge of the side and then sweating them together with the soldering iron. A rectangular piece of metal is fitted into the tank's bottom where it rests on the flaps and is soldered.

Slits are then cut around the mouth of the

[*Continued on page 127*]

Film is guided into the hanger by placing two fingers at the openings of the grooved strips. Amounts of solution to use with each size film are: Vest pocket, 13 oz.; 2½x3½, 12 oz.; 9x12cm, 21 oz.



Substitute For Opal Glass

To make an imitation opal glass that is equal in diffusing properties to the genuine, coat each side of a sheet of clear glass with thin glossy white enamel. One side should be treated at a time so that it may dry evenly in a level position.—*Kenneth Murray.*

Practical

Cover For Enlarger

When an enlarger is not in use, it should be protected against dust with a hood that covers it completely. The one pictured above was made from one yard of white oilcloth, folded over once with the two seams cemented rather than sewn together.—*Kenneth Murray.*

Electric Water Purifier

Impurities can be precipitated from ordinary tap water to be used in making up developing solutions with two sheets of strip aluminum connected to the 110 volt house current. Use a short dowel or piece of rubber tubing to keep one end of the strips separated, riveting the other ends to the prongs of a rubber attachment plug. Water will reach the boiling point a short time after the device is immersed in it, and when allowed to cool impurities will settle to the bottom. The clear water may then be poured off.—*Kenneth Murray.*

Speedy Film Washer

A one pound coffee can with half a dozen holes punched in the bottom makes an excellent roll film washer when suspended below the faucet. Drop the reel in the can and adjust the flow of water so it remains level just above the top of the reel.—*Bruce Cole.*

Handy Formula File

A ten cent store cooking recipe file can be very easily converted to hold your photographic formulas. Tides on the cards and table of weights and measures are clipped from photo catalogs, magazines or other publications, then pasted in place.—*A. Trauffer.*

Handling Big Prints

A simple method of developing 11 x 14 enlargements in 8 x 10 trays is to first soak the enlargement in water after exposure, and then place it in the 8 x 10 tray of developer doubled over with the emulsion side out. Fill the tray with enough solution to completely cover the upper layer.—*Louis Hochmen.*

Photo Kinks

Deckle Edge Printing Mask

A uniform deckle edge opening is given to printing masks by substituting a coarse saw blade for a ruler in cutting out the waste portion. Allow the razor blade or other cutter to follow the toothed edge with even pressure.—*Kenneth Murray.*

Slot Holds Film Tabs

Film pack tabs can be prevented from becoming frayed, curled up and torn by simply cutting a slot across the top of the pack's shield and shoving the tabs into it when the shield is pushed down. Tabs will "stay put."—*Andrew Vena.*

In this department the photography editor will answer any questions or problems relating to cameras of all types, enlarging, developing, printing, taking pictures, and the various phases of home movie making. When sending questions to this department be sure to inclose a self-addressed, stamped envelope so that we can answer directly in case space does not permit answering in this page. Send inquiries to Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York, N. Y.

FERROTYPING PRINTS

Q. Do some prints dry with a gloss or must they all be ferrotyped? Do chrome tins yield a higher gloss than black tins?—Herman Cavatti, Alderton, Wash.

A. Printing paper marked "glossy" will not dry with a high gloss unless ferrotyped. In this respect, chrome tins do not necessarily give a higher gloss than black tins. Chrome tins, however, are usually preferred because they do not need polishing and will last indefinitely if cared for properly. Black tins require occasional polishing, but are lower priced. They give as good a gloss, however.

LIGHT POSITION IN HOUSING

Q. How do you calculate the position of the light in an enlarger's lamp-housing?—L. Powers, Trenton, N. J.

A. The exact position of the light in the lamp-housing frequently depends on the shape of the housing itself. Assuming that you are using a standard shaped reflector for your housing, just set to it that the bottom of the bulb is not closer than two or three inches to the negative—or the heat of the bulb might effect the negative. Undoubtedly, you can deduct from this that the shape of the bulb may also have something to do with the depth of the lamp-housing. Adjustment of the light should be up and down and allowance for this movement need not be more than an inch either way. One of the difficulties usually encountered, which necessitates such up or down adjustment of the light source and bulb, is the appearance of a spot of light in the center of the enlarging paper. This spot is due to uneven diffusion. By adjusting the light in the housing up or down slightly, it is possible to eliminate this spot and obtain even diffusion.

8 MM PICTURES ON 16 MM FRAMES

Q. What is the meaning of "double 8 mm" movie film? —M. Robinson, Windsor, Vt.

A. Some movie cameras use a 16 mm film but take 8 mm frames, thus doubling the length of the film. The 16 mm film is cut into 8 mm strips during the processing in the dark room.

ANTI-HALATION FILM

Q. What is halation and why are some films marked "anti-halation"?—R. G. Sappino, New Orleans, La.

A. Halation is an effect that causes blurring of the image. It results from an encroachment of the high lights on the shadows and darker parts of the negatives. It usually results when taking interior pictures while the camera faces uncovered windows. In exterior pictures, halation sometimes appears when photographing leafless trees against a brilliant sky. It is caused by reflection from the back of the plate or film. The remedy is to provide some backing on the film or to use matt-surfaced film. Anti-halation film has a thick coating of a solution, usually containing iodide of silver, on the back. This coating washes off in the development process. When halation occurs, it may be treated by local reduction. Best procedure when taking interiors is to soften the hard light coming through the windows by drawing the shade or curtains, etc.

FACTS ON COLOR PHOTOGRAPHY

Q. Please answer the following questions. (1) What type of camera is best suited for use with color film? (2) Do the prints come out as colored or as black and whites? (3) Where and how are they developed? (4) Are prints automatically colored when printed or must they be hand tinted? —Herman Cavatti, Alderton, Wash.

A. (1). Standard roll film cameras may be used with Dufaycolor film. Up to very recently Kodachrome could only be used in 35 mm miniature cameras. Now, however, Kodachrome has been made available in cut film of various sizes for cameras that will take plate and film holders. (2). When the film is processed it comes out as a positive transparency. It cannot be printed directly on ordinary sensitized printing paper. In this condition the film is in condition to be projected for viewing on a screen. (3). In the case of Kodachrome, the price of the film includes processing by the Eastman Kodak Co. at Rochester, N. Y. Kodachrome cannot be processed by the photographer in the dark room because its method of processing is a secret of Eastman's. Dufaycolor, however, may be processed by both amateurs and professionals in their dark rooms. Directions for processing are available from the Dufaycolor Corp., New York, N. Y. (4) Prints are not hand tinted. Neither are they "automatically colored." Prints are made from color transparencies by a three-color separation process in the dark room. The process is a complicated one and requires considerable manipulation skill. Books on the technique are available from photographic dealers.

OPAL GLASS vs. CONDENSER LENS

Q. Can I substitute a ground glass or opal glass in place of a condenser lens for the Minineg enlarge?—H. N. Neeruff, Denver, Colo.

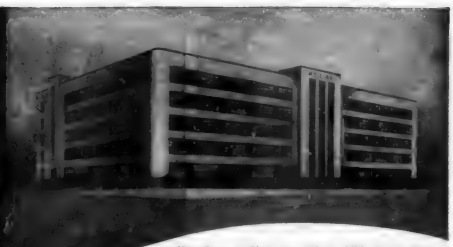
A. You are under a mistaken impression if you think the condenser can be disposed of and replaced by a ground glass or opal glass. The function of condensers in an enlarger is to collect the light from the bulb that shoots in all directions and concentrate that light into a single beam as it is projected through the negative. The condenser increases the amount of light passing through the negative simply because there is less loss resulting from its use. On the other hand, opal or ground glass merely serve to diffuse and soften the light before it strikes the negative. This would result in considerable light loss if used in an enlarger designed for a condenser.

HOMEMADE FILTERS

Q. I am interested in making my own filters from glass or other materials. Please advise me what is available and how to go about it.—Howard Custer, Rochester, N. Y.

A. You can make your own filters simply by purchasing sheets of gelatin available in different colors and densities from any photographic dealer. Place these gelatin sheets between glass and bind the edges with scotch tape. Your next problem is to devise a holder to take the filter and fit over the barrel of your camera lens. Such holders may be obtained ready made and are interchangeable for different filters. You can also purchase glass filters to slip into these holders.

KODAK PRICES SHARPLY REDUCED



New Eastman Plant, extensive addition to camera factory already the largest in the world, as it will appear when completed. Here will be produced the finest precision cameras, made by the largest group of American craftsmen ever assembled in the photographic industry.

Building an addition to the world's largest camera works means substantial savings on practically entire 1939 Kodak line

IT SEEMS that all America is making pictures. Wherever you go, you see more and more people carrying cameras. To meet this present greatly increased camera demand—and with an eye to the future—Eastman is now building an addition to the largest camera works in the world.

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EXAMPLES OF THE PRICE REDUCTIONS

KODAKS	WAS	NOW
Kodak Junior Six-20, Series II, Single lens	$8.75	$7.75
Kodak Junior Six-20, Series II, Bimat lens	11.00	10.00
Kodak Junior Six-16, Series II, Single lens	10.25	9.25
Kodak Junior Six-16, Series II, Bimat lens	12.75	11.50
Kodak Senior Six-20, K. A. *f*.7.7 lens	17.00	15.00
Kodak Senior Six-20, K. A. *f*.6.3 lens, Diomatic shutter	21.00	19.00
Kodak Senior Six-20, K. A. *f*.4.5 lens	28.00	25.00
Kodak Senior Six-16, K. A. *f*.7.7 lens	19.50	17.00
Kodak Senior Six-16, K. A. *f*.6.3 lens, Diomatic shutter	24.50	22.50
Kodak Senior Six-16, K. A. *f*.4.5 lens	32.00	29.00

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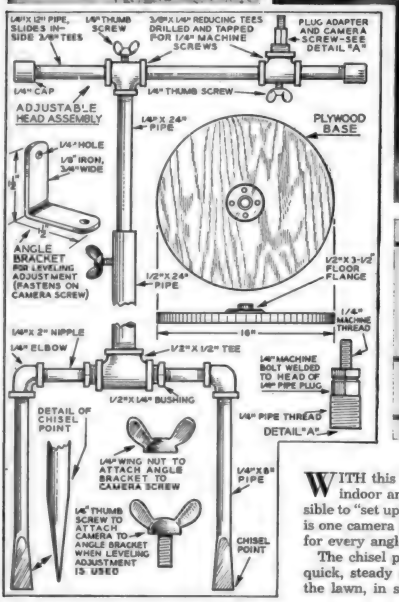
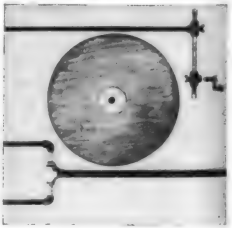
Kodak Bantam, K. A. *f*.6.3 lens	$9.50	$8.50
Kodak Bantam, K. A. *f*.5.6 lens	16.50	14.00
Kodak Bantam, K. A. Special *f*.4.5 lens	27.50	22.50
Kodak 35, K. A. *f*.5.6 lens	18.50	14.50
Kodak 35, K. A. *f*.4.5 lens	29.50	24.50
Kodak 35, K. A. Special *f*.3.5 lens	39.50	33.50
Kodak Duo Six-20, Series II, K. A. *f*.3.5 lens (Compur-Rapid shutter)	57.50	52.50
Kodak Retina II, Anastigmat *f*.2.0 lens, Compur-Rapid shutter (with field case)	140.00	120.00
CINÉ-KODAKS		
Ciné-Kodak Eight, Model 20, *f*.3.5	82.50	29.50
Ciné-Kodak, Model K, *f*.1.9 (without case)	88.50	88.00

Be sure to see your Kodak dealer about these remarkable price reductions.

"UNIPOD" MADE OF PIPE





WITH this easily-made camera "unipod" for indoor and outdoor photography, it is possible to "set up" for every conceivable shot. This is one camera holder that is instantly adjustable for every angle and position.

The chisel points on the outdoor foot provide quick, steady anchorage on uneven ground, on the lawn, in sandy or muddy situations where

an ordinary tripod would often be cumbersome and slow to adjust. Slight foot pressure will force the chisel points into the ground, and for indoor use on level floors or pavements the light plywood base provides a secure and efficient base for the adjustable pipe support and top which swings and tilts instantly as desired.

Because it is made of pipe this "unipod" can be knocked down and carried in any way to suit the user. No wrench is required for any of the adjustments.

Start by drilling $\frac{3}{16}$-in. holes in the two ¾x¼-in. tees where shown and 1-in. from the unthreaded end of the ½-in. pipe. Tap these three holes to receive the ¼-in. thumb screws. Weld the head of the ¼-in. machine bolt on top of the pipe plug to form the camera screw adapter. After welding, square up the four sides with a file or on the emery wheel. Round the corners and drill ¼-in. holes in the ⅛x¾x3-in. iron and bend it to form a right angle. The bend can be made cold in a vise. Flatten out the ends of the two pieces of ¼x8-in. pipe to form the chisel points. This can also be done cold on a small anvil or flat piece of iron. Cut out the plywood base, screw on the ½x3½-in. floor flange and the dual purpose "unipod" is ready to use.

With the lengths of pipe listed the "unipod" can be raised to a maximum height of 4 feet, and can be lowered to 2 feet. If more height is required provide additional pipe.

LIST OF MATERIALS

Head and Support

1 piece ½x24-in. B. I. pipe threaded one end
1 piece ¼x24-in. B. I. pipe threaded one end
1 piece ¼x12-in. B. I. pipe threaded both ends
2 ¼-in. B. I. caps
2 ¾x¼-in. B. I. reducing tees
1 ¼-in. B. I. plug
1 ¼x1½-in. machine bolt
4 ¼-in. thumb screws
1 ⅛x¾x3-in. strap iron
1 ¼-in. wing nut

Base Assembly for Chisel Point Pipe

2 pieces ¼x8-in. B. I. pipe threaded one end
2 ¼x2-in. B. I. nipples
2 ¼-in. B. I. elbows
2 ½x¼-in. B. I. bushings
1 ½x½-in. B. I. tee

Plywood Base Assembly

1 piece 16x16-in.—¾-in. 5 plywood
1 ½x3½-in. B. I. floor flange
4 ½-in. No. 6 flathead bright wood screws

A German scientist has reported success in coming within four-thousandths of a degree of achieving absolute zero by a method involving magnetism.

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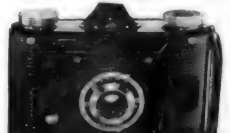
New Agfa f6.3 Clipper... $15.50



THE Agfa f6.3 Clipper Special features new telescoping front which eliminates bellows; shutter speeds of 1/25th to 1/100th second, bulb and time, hinged back, easy loading arrangement, shutter release guard, tripod socket, and built-in depth-of-field scale. Takes 15 pictures, (2 1/2 x 2 1/16) on one roll of PD16 (616) film. Complete with neckcord and lens cap, $15.50. *Made by Agfa Ansco Corporation in Binghamton, New York, U.S.A.*

AGFA CAMERAS

4-in-1 Film Mask

Fig. 1

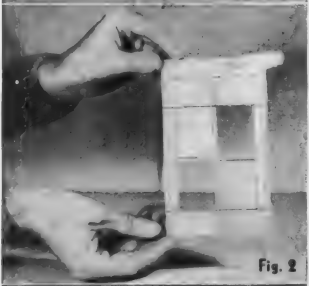


Fig. 2

Fig. 3

FOUR shots on one negative; forty-eight on a dozen negatives—what could be more ideal from a Scotchman's standpoint.

If you find it necessary to make a great many shots of something, but haven't a small camera and don't wish to use an entire negative for each exposure, these masks will prove to be a happy solution to an otherwise expensive problem.

The original masks were made for a hand camera using 3¼x4¼-in. packs or cut film but they can be made for any size camera of the same type.

With a device of this sort it is a simple matter to accurately place four shots on one negative, thus making one negative do the work of four. In record and copy work this economy mounts up rapidly. The negatives are of sufficient size to enlarge without difficulty and are also large enough to give a contact print of a size that can be examined easily with the unaided eye. In addition, the masks may be used with film packs in the same manner as with cut film.

An old piece of cut film is first divided into four sections and a slight border drawn around each section as in Fig. 1. This is easy to do with either a sharp pencil or some pointed metal object such as a knife or ice pick.

Next, a light cardboard pattern is cut to the exact shape of the cut film slide. On this cardboard slide the windows are drawn at the proper places and then cut out with a sharp knife or razor blade, the object being to check proper alignment with the pattern

Fig. 4

negative. Cardboard pattern is seen in Fig. 2.

I chose to divide my film into four sections; each section giving me a negative 1¼x1¾-in. with a $\frac{1}{16}$-in. margin separating the sections from each other and bordering the outside edges.

For the masks proper get a piece of light weight copper or brass the same thickness as your slides and large enough to make two. Carefully mark out the proper shape for the masks, cut them out with a pair of tin snips and file them to exact size and shape. Lay the cardboard pattern on one of the pieces of metal and carefully trace the outline of *one* of the windows on the metal. Repeat the process on the other slide-to-be with this exception—you'll be tracing the *other* hole this time. Put the *upper* hole on one slide and the *lower* hole on the other.

The metal may be cut out by using a jewelers saw, jig saw, cold chisel or even a coping saw. File the margins of the window smooth, straight and to exact size. Remove all burrs, wire edges and rough spots. Put the pattern negative in your cut film holder and try the masks in the holder to see that the windows line up with the pattern.

Any auto paint shop will spray the masks with a coat of dull black lacquer for a very small charge and you will have a job good for many years of service.

Lacquer was scraped off the edges of the masks shown here for greater smoothness in sliding in and out of the holders. (Fig. 3).

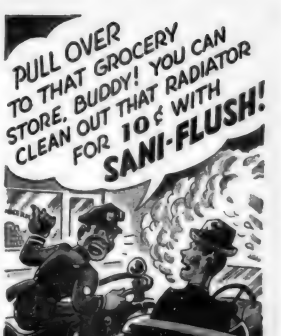
In use, reversing and turning over the two masks will give control over the section of the negative being exposed.

The ground glass focusing screen in the camera is, of course, used in centering the image for each exposure and the ground glass must be lined off to correspond with the masks. This, however, is a very simple task since you know the size of your original negative and also of your four negatives to be. Find the center of the glass and draw the rectangles in their proper positions.

The glass may be marked with a sharp, medium hard pencil (on the ground side) and will hold the marks indefinitely.

Make a test negative (Fig. 4) to be sure all is well and you'll be off to get all those shots you've wanted for so long—and at little expense for material.—*Harry Smith.*

One electric company turns out items as small as a "grain of wheat" surgical lamp and as big as a two million pound water-wheel generator built for Boulder dam.



Rust, scale and sediment accumulate in the delicate veins of a car radiator. Water circulates poorly. The car overheats. Power is lost. And you may be heading for expensive trouble.

You can clean out your car radiator with Sani-Flush for 10c (25c for the largest trucks and tractors). It's easy to do yourself. Pour in Sani-Flush. Run the engine. Drain, flush and refill with clean water (*directions on the can*). Or, if you prefer, have your garage or service station use Sani-Flush to do the job. It cannot injure the motor or fittings. You'll find Sani-Flush in most bathrooms for cleaning toilets. Sold by grocery, drug, hardware, and five-and-ten-cent stores. 25c and 10c sizes. The Hygienic Products Company, Canton, Ohio.

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Science Secrets Revealed

[Continued from page 39]

current variations in other circuits) which operate his 11 motors by remote control. He walks with a peculiar limp, as only one leg bends. In spite of this infirmity he is probably the most educated robot alive.

He converts the sound vibrations of prearranged commands into electrical impulses, as a telephone does, and these impulses set him in motion. He is quite indifferent to what words are used. The number and spacing of syllables are what he pays attention to. If vocal impulses in the wording of a command are not delivered just right, Elektro may disobey or lers, too. During a laboratory demonstration his mechanism became rambunctious and instead of saluting as he was commanded, he began walking backwards. He continued backwards oblivious of the commands of the demonstrator whose words became a jumble in the excitement. The *coupe de grace* was delivered by Westinghouse-Engineer J. M. Barnett who shut off the electric current supplying the robot with power. And just in time—or Elektro might have gone on backwards right through the wall!

Nearby, on huge screens, a virtual 12-ring circus is in constant performance in which queer animals one-thousandth of an inch long are magnified to the size of jack rabbits. The performers are microscopic organisms whose world is a drop of water. The ring master is Dr. George Roemmert who calls his strange scientific invention the microvivarium.

The microvivarium is a jitterbug realm, ordinarily invisible, in which strange bits of animal life spend their time spinning around on their noses. Here visitors may watch the beating hearts of transparent water fleas and see unborn babies stirring in their brood pouch. The machine that reveals them magnifies their size two thousand times.

Dr. Roemmert's microbes are not exactly pets but he cares for them as if they were so many Park Avenue poodles. Their temperature and food must be regulated carefully and the water in which they perform must be specially prepared. The ring master brews a kind of tea with hay. He drops in a tidbit of decayed plant material and the microbe acrobats, clowns and daredevils start their gyrations.

Like the circus clown, they are carefully made up. A transparent animalicule, for instance, is fed a red dye just before he goes on with his act. The observer is thus enabled to see his digestive appartus in action. The drama of life in this microbe world is as carefully staged as a Broadway hit. A slow-moving scene opens the first act. Nice little bugs are shown having a picnic. Then the big, bad wolf comes stalking, swishing its tail, puffing itself up and bent on destruction. A terrific, devastating death battle results which is real and thrilling. You forget that the contestants are invisible to the unaided eye.

If seeing is believing, you will have to trust your eyes and ears when two ordinary flashlights make their appearance as virtuosos of the marimba! A technician points the lights at a marimba and the instrument beats out a tune that marks the dawn of a new day in swing music. "Marimba" is the name of a 3½-octave instrument equipped with photo-electric cells and grid tubes. The flashlights provide the lighting to activate the photo cells. The ordinary hand action of striking the resonant bars with a hammer is

Dr. George Roemmert is shown with one of the 12 microscope reflector units which he uses in presenting the Microvivarium exhibit in Westinghouse's "playground of science" at the World's Fair. On screens of five-foot diameter, images of one-cell animals whose world is a drop of water, are magnified 2,000 times in their actual colors. Spectators observe their birth, love-making, battles and deaths. As a climax, the Westinghouse Sterilamp is turned on them. Under its deadly rays they disintegrate and disappear.

This dynagraph machine records the strain on a rod, when a person stands on it, and transmits that strain in your weight.

simulated by electrically driven hammers which vibrate when light strikes the electric eyes. The marimba is played from a distance of 15 feet but scientists estimate that by optical refinements and application of the principle of light-beam relays, the instrument could be played at distances up to 300 to 400 feet.

And just to retain you in that illusionary world of magic when you leave the marvelous halls of science, engineers have devised a spectacular lighting demonstration for the perisphere that simulates a floating planet. The effect devised shows the perisphere wreathed in clouds and deep in etheral blue light whirling through space.

The peculiar blue light and whirling clouds over the surface of the perisphere are created by 340 lighting projectors placed on roofs of nearby buildings. Six cloud projectors will help convey the idea of inter-planetary space. A special control system makes possible smooth change of colors and shifting of clouds.

These are but a few of the wonders of science designed to entertain you at the Fair, where science has directed its skill toward dramatizing its research and discoveries.

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Makes Money While He Plays

[Continued from page 51]

phonic conductors have adopted this drum for their orchestras. Most of the big swing drummers use it, too. Chick Webb, for one, has made the drum part of a complete set of Billy's musical inventions in his band.

Gladstone also invented a bass drum with a damper control, placed on the inside of the instrument, which drowns out the booming after effect, when so desired, much more efficiently than with the old style drum. Another drum creation of his is of the kettle variety, which has none of the conventional inside tuning gadgets and for that matter very little mechanism at all.

The tuning of this kettle drum is done from the outside; the volume is registered by a gage, which enables a drummer to keep pounding away without jerking his ear up and down against the drumhead as he taps on it with fingers to ascertain the sound.

Still another Gladstone drum is a tom-tom contraption, which combines in a single instrument, one drumhead over the other, the three tom tom drums used in bands. It is a time saver and also a general improvement over the old-style instrument tonally.

Some of the patents for these drums have been only recently applied for. The first substantial check for his drum royalties arrived early in 1937. It was for $179. Since that time the Fred. Gretsch Manufacturing Company, of New York and Chicago, which makes all of Billy's musical things, has been mailing in sizeable sums.

When you consider Billy Gladstone's assortment of patented drumsticks and mallets they amount to a major achievement in themselves. These sticks and mallets are for bells, xylophones, marimbaphones, vibraphones and bagpipes, to say nothing of the drum tribe. Those destined for the bagpipes are called "Scotch" sticks mainly because they will last for years.

In 1932 Billy invented a light hollow drumstick made of fibreloid, an unbreakable substance. The striking knob was of rubber or Lucite, according to sound requirements. The handle tips were encircled with colored bands which made them easily identifiable during speedy drum operations.

These sticks and mallets brought their inventor handsome returns although they have been marketed only a year. As a tribute to their superiority, they have been adopted by the greatest living xylophonists, Hiroaka, Red Norva and Sam Herman.

In the pioneer days of sound pictures he developed such a technique of producing queer noise simulations that he was much in demand at the New York studios. He helped to make one of the first sound recordings for a Walt Disney animated cartoon and did splendidly until he had to double for a parrot's voice. He swallowed the gadget used for this purpose and had some job getting it up on dry land again. His colleagues believe he let go of the thing when he suddenly thought of some brilliant idea for an invention!

Today, Billy Gladstone lives and works at his inventions in an apartment overlooking the East River in Manhattan. His work bench is an old grand piano, the top of which is usually littered with dismantled musical instruments, blueprints, wire and bits of metal.

Billy doesn't draw very well. Sometimes, he finds it tough to express his ideas in terms of geometric lines and angles. But he gets his ideas over to his model maker, and you need only talk with him five minutes to realize that he is an old hand at his craft. He has trod a long way along the path of heartbreak and success.

Chick Webb rates Inventor Gladstone's musical creations so highly that he equipped his drums and traps with them.

"I am only now bringing to fruition a lot of ideas that have been tucked away too long in my head," he told me. "Inventing is like anything else. You've got to get right into it. Once you do, things start to take shape. You get going fast.

"For years I had thought up many little devices and mechanical improvements on things. I foolishly showed them to people, I suddenly woke up

to find my ideas had been filched. My gadgets were being patented by others."

Billy says he didn't start to click with his inventions until he went to the Music Hall in 1932. "Maybe, it was because I never got discouraged," he explained. "Maybe, I was due for a break. I daresay I wasn't ready before 1932 to cash in. I don't know. But I never gave up; I kept plugging, trying.

"It may sound strange, but sometimes in my despair I was ready to tear up my patents. When my ideas didn't seem to interest a manufacturer I just wanted to throw them in the waste-basket.

"A struggling inventor is up against a lot of problems. He ought to study the field thoroughly, just as he would going into any other work. It isn't merely a question of possessing an interesting idea. More important considerations are: Is it practical? Will it work? Can it be made at small cost?

"Manufacturers are keen today for things which can fit in with their machinery, raw materials and program. Simplicity is a great drawing card with them. It'll get a man to first base right away if he has something worthwhile. Take my key case. It's just a round chain and a bit of leather with a couple of holes plugged in it. In fact, the manufacturer uses the leftover from wallet cuttings, which is a boon to him."

When admirers survey Billy Gladstone's array of inventions the first question they usually ask is: How do you do it? His answer is simple. He studies the thing he wants to improve or create. He works it over and over in his mind until some tangible picture emerges. Sometimes the image crystallizes as he pounds away at the percussion instruments, sometimes as he deliriously dodges charging taxicabs along busy Fiftieth street while stage door attendants gasp with horror.

Whatever the case may be Billy gets as soon as possible to pad and pencil and scrawls his brain child down. Then he polishes the sketch until he's satisfied it's right, and takes it around to his patent attorney. Getting the proper advice is as important as creating the idea, he says.

"You can't be too careful, today," he explained. "I always have copies of my final sketches notarized, dated, sealed with wax and mailed to myself. I do this before ever mentioning a word of the invention to anyone except my attorney."

But getting the patent and then a prospective manufacturer may not end the inventor's struggle, according to young Mr. Gladstone. "Manufacturers are in business. Not infrequently they have bought something similar to your device, but perhaps not so good. They'll sign a contract with you and put your invention on a shelf to rust. That's why I advise having a good attorney. Business is business. There's plenty of money if you hit on the right inventions. But everything may depend upon the connections you make. So watch out."

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Plastics From Farm Waste

[Continued from page 67]

you will get to work with your milk-barrelled fountain pen and write a check on a sheet made of milk-surfaced paper. And if you do not feel like working, you may thumb through the glossy, milk-coated pages of a popular magazine."

This picture of a milk-made world may be slightly exaggerated, but it contains an important idea—the trend of modern chemurgy is to make farm products industrially useful. Nothing escapes the eagle eye of the modern farm chemist. For instance, the postage stamps you lick in the next few years may be coated with sweet potato glue. This adhesive is the result of work carried on in Laurel, Mississippi, where about 200,000 bushels of sweet potatoes were processed last year into flour, syrups, and other products besides glue. Henry Ford's pet crop, soybeans, is a gold mine for the agriculturally-minded synthetic chemist. This humble bean, nothing but a nuisance several decades ago, has become a symbol of what the laboratory can do with plants. From it researchers have made valuable oils, rubber and leather substitutes, and even materials that act like female sex hormones and may be used to treat some cases of sterility.

Soybean plastics are used for automobile knobs and handles and scientists are now developing a method for molding entire doors from the substance. As if it weren't enough to get fabrics from milk and a thousand other plants, a process for obtaining cloth-like fibers from soybeans may well be patented within the coming year.

Another new and extremely important field is the use of sugarcane wastes, which are now being transformed into insulating board and a legion of other articles for the building industries.

Molded plastics from sawdust particles is another contribution by science to low-cost wood-plastic production. This material may be used in floorings, walls and for a variety of building purposes. Made by special chemical process.

Coat, vest, sleeve buttons, cigarette holder, pencil, calendar pad base and blotter in the above picture are all made from milk plastics. Even the cloth for suits is now being made from milk wool. Science is even playing around with the idea of synthetic men, but not in plastic form!

To coordinate and improve investigation in the chemurgy line, the National Farm Chemurgic Council was formed in 1935, with offices in Columbus, Ohio, and the value of the organization is shown by the rapidly increasing acreage being devoted to crops for American industry. Every nation in the world is backing its chemists in a vast drive to become as self-sufficient as possible. The soybean is being grown in Rumania and other Central European countries; Holland is developing a plastic from potatoes; and Germany's chemical industry, the world's greatest in 1914, has expanded 40 percent in the last three years. But with its chemurgy, coal and natural gas industries, and abundance of raw materials, the United States is perhaps the world's leading synthetic chemical producer, and it could leave other nations far in the rear if it paid more attention to experimental work. Russia has 100,000 workers in research, Germany has 70,000—the United States has only about 30,000.

That American synthetic chemistry is so far advanced is largely due to the high quality of our pioneers experts—among them Dr. George Curme, who showed industry how to take chemicals from natural gases; John Hyatt and Dr. Leo. Baekeland, trail-blazers in plastics; and Dr. George Washington Carver, the Tuskegee Negro—peanut magician.

Lathe-Turned Box

[*Continued from page* 80]

lacquer liberally. Only in this way can you keep the high luster of the copper permanent.

The lid knob can be turned from a scrap of contrasty wood which is finished by dipping in lacquer and fastening with a small screw through the hole in the lid.

You can equally well use sheet aluminum for the top if you wish. This will spin perhaps even more easily, but copper goes so nicely with the warm colors of most woods that it is preferable. You can use poplar in place of the maple and stain it maple for an almost equally pleasing effect. Birch can likewise be used if desired. It is important to use a solid block of wood instead of a block glued up, if possible, for the solid block permits the natural continuation of grain which adds much to the beauty of the finished project.

A Barbecue Is Fun

[*Continued from page* 77]

cleaning out ashes. Unless a flue or opening is cut through to the chimney to carry off smoke this type can use only charcoal or other non-smoking fuel If such an arrangement is made the fireplace will be much more satisfactory—and comfortable for the chef who doesn't do so well with smoke in his eyes. The kettle can be let down on a chain and used for cooking beans, soups, etc.

Materials for garden fireplaces are available for almost nothing in nearly every locality, especially if field stone is used. The cost of cement does not run to any considerable figure, and grate bars, grills and hot plates usually can be picked up at a junk yard.

German canners have found a satisfactory way of making a transparent plastic container for preserved food.

A new device for boiling and sterilizing surgical instruments is a glass enclosed electric coil that produces boiling water in 12 seconds and turns it to steam in three more seconds.

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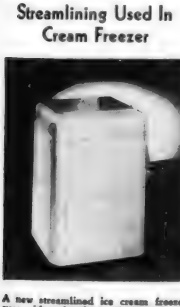

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INVENTORS—Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorneys' Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, 426 Bowen Building, Washington, D. C.

"INVENTOR'S Guidebook" containing 96 mechanical movements and advice about patenting, selling inventions, also "Record of Invention", Free. Frank A. Ledermann, Patent Attorney-Engineer, 154 Nassau Street, New York.

Window Bracket Fan Blows Air Either Way

Mounted on a swivel, a novel fan can be quickly turned either to pull out stale air or to bring fresh air into a room. Circulating 1,600 cubic feet of air per minute, the fan is said to be able to bring room temperature within three degrees of that outside. The bracket fits any window and is adjustable for centering the fan. It can be swung out of the way when not in use.

Cabinet Protects Milk From Weather

All-metal insulated cabinet can be heated by a 40-watt Mazda lamp to prevent milk from freezing in winter, while in summer insulation keeps the milk cool.

INVENTORS: Send for my free 72-page book. Conscientious, prompt personal service on all patent matters. Registered Patent Attorney, L. F. Randolph, Dept. 763, Washington, D. C.

PATENTS. Booklet free. Highest references. Best results. Reasonable fees. Watson E. Coleman, Victor Building, Washington, D. C.

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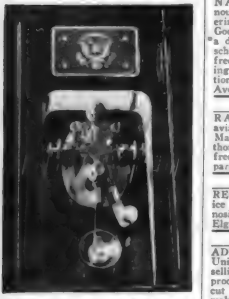
President Gets Telegraph Key



A new official telegraph key for the White House, for use when Presidents officiate by proxy at distant ceremonies, has been presented to President Roosevelt by Western Union.

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ROLL Developed, 2 prints each negative 25c. Three 5 x 7 enlargements 25c. We repair cameras. Bell, 1360 George, Chicago.

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125—8½x11 BOND Letterheads and 125 Envelopes, both printed, $1.00 prepaid. Bennerville, 907 West Roosevelt, Philadelphia.

500 LETTERHEADS, envelopes, billheads; each, $1.50. Gibson, 218 Knights Ave., Camden, N. J.

STOCK Cuts, 50c Up. Catalog Dime. L. Gregor, 79 Main Street, Belleville, N. J.

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SPECTROSCOPE quickest way to analyze chemicals, ores $2.50. Cudding Sons, Campbell, California.

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TATTOOING Outfits, Supplies, Illustrated list 3c. Percy Waters, Anniston, Alabama.

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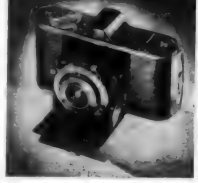
New Miniature Camera



Equipped with an f:3.5 corrected anastigmat lens focusing from 3½ feet to infinity, a newly developed miniature camera is fitted with a new and improved type of shutter designed for greater accuracy and giving speeds of ½ to 1/200 second, bulb and time.

Outboard Motor Is Streamlined

This new single cylinder outboard engine is rated at 2.4 horsepower. Designed in streamline, it is capable of running three hours on a gallon of gasoline.

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NEW Adding Machine only $4.95. Full size, five columns. Reliable. Accurate. Easy to operate. Guaranteed. Money back if not satisfied. Only $4.95 postpaid, or C.O.D. plus postage. Kel-Sar Mfg. Co., Dept. 8-C, Dayton, Ohio.

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WATCHES—Cleaned, oiled, polished, mainspring, crystal 99c. Magic Process, Royal Oak, Mich.

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75-200 AMPERE Arc Welders from Dodge generators, Complete Plans 35c. 100 other generator changes. LeJay Manufacturing, 314 LeJay Building, Minneapolis, Minn.

STARTER coils and $5.00 makes powerful 110-220 Volt A.C. welder. (No rewinding.) Pole transformer makes 200A welder. Plans $1.00. Information time. Welders Supply Company, Dept. M, Bellefontaine, Ohio.

WIND ELECTRIC PLANT

BUILD electric plant for your cabin. Operates from wind. Complete plans and valuable catalog 10c. LeJay Manufacturing, 414 LeJay Building, Minneapolis, Minn.

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TO ALL wood lovers and wood users—start your own collection of woods of the world. Fascinating, useful. Complete index, sample batch of rare woods. Gain prospectors—all sent for thirty cents. Woodcrafters Guild—Jr. 47-45 Vernon Boulevard, L.I.C., N. Y.

Linoleum Flooring Most Comfortable

Linoleum flooring of several varieties is the most comfortable to the walker because it is the most yielding, yet at the same time it has high resistance to permanent denting from loads placed on it, a study by the National Bureau of Standards has shown.

Compared with rubber, felt-base materials, asphalt tile and several other flooring materials without consideration of other important factors such as wearability, it yielded most under test loads and returned most nearly to a normal, level surface, P. A. Sigler and Myrtle B. Woodward of the Bureau's staff of scientists have determined.

But it is not the cheapest of the low-cost floor coverings, they warn in their study, carried out as part of the Bureau's investigation of low-cost housing materials, now being carried out at the direction of Congress. Felt-base compositions are the cheapest, although they become indented most easily and are among the less resilient materials.

Twenty-three different materials were placed under loads of 25, 50, 100, 150 and 200 pounds, each resting on a plunger atop a rod whose diameter of one-fourth of an inch meant that the load in pounds per square inch was many times higher. The test followed typical Bureau procedure, now famous for its securing of effective information about how everyday products behave in service.

Pressures used in the tests were deliberately high for two reasons: to secure the worst possible conditions that might be inflicted on a floor covering in a home and to make allowances for the fact that a man, resting his weight momentarily on a piece of gravel or on his heel, could exert large loads. Rubber sheet was second to the several types of linoleum that turned out best. Incidentally, the Bureau's scientists warn the home owner again that the best way to keep dents out of floors is to make sure that furniture casters have a large surface in contact with the floor.

Stranded Tropical Turtles Trace Ocean Current Drift

Drifting ocean currents, winding their way from the warm parts of the Atlantic both on the American and European sides may have a new proof of their existence — tropical turtles stranded from time to time on the English coast.

Four loggerhead stranded turtles have been related by H. W. Parker of the British Museum with southwesterly gales and continued warm weather in the south of England. The species is common on both sides of the Atlantic, so Mr. Parker is not sure just which side they came from.

Last year, the United States used well over a billion pounds of rubber, in contrast to only 45 million pounds in 1900.

To produce a knotless lumber, a government scientist recommends pruning forest trees young, by sawing them off close to the trunk.

ADLETS FOR HOBBYISTS

(See regular classified section for rates and other information.)

STAMPS

SUPER-WONDER Packet offered, containing 60 different stamps from Afghanistan, Transjordania, North Borneo, Manchukuo, Sudan, Guadeloupe, Iraq, Sarawak, French and British Colonies, including natives, beasts, ships, etc. This entire packet for only 5c to approval applicants. Big illustrated lists free. Kent Stamp Company, Box 87-Z (G.P.O.), Brooklyn, N. Y.

BADEN—Scarce old Genuine Baden, Liberian Bongo Antelope, Mystery British Colony Triangle, Fantastic Manchukuo, Breathtaking Cayman Islands, $5 United States, Bizarre Negri Sembilan, Grande Comore Islands. Everything 3c with approvals. Viking, 1-R Hanson Pl., Brooklyn, N. Y.

WILL ROGERS—Nicaragua; Ecuador—USA Constitution; set of 3 Costa Rica Diamond shape airmails; and scarce Tannou-Touva Triangle. All 6 beautiful stamps for only 10c to approval applicants. A real Bargain! Falk, Inc., Box 5?2, Jacksonville, Florida.

DESIRABLE Imperforate Miniature Sheet of Four Triangular Stamps (extremely limited issue) with 50 different World Collection, only 10c. Friendly Filatelists, Box 4428M, Philadelphia, Penna.

STAMPS! 100 diff. 3c; 500 diff. 35c; 1,000 diff. 90c! Illustrated Album (4000 spaces) 22c. Approvals sent. Tatham Stamp Co. (D9) Springfield, Mass.

UNITED STATES, 45 different, Perforation Gauge, Hinges, Pricelist; 10c. Seidenbergh, Baroda, Mich.

FREE!!! Two Coronation Sets. Postage 3c. Roberts, 3127 Shearerbldg, Baycity, Michigan.

TEN different United States, over 40 years old, 10c. Guy Elsea, Bowling Green, Ohio.

PACKET 50 Different Used 7c. Boyd, 4200 Preston, Ft. Worth, Texas.

INDIAN CURIOS & RELICS

12 ARROWHEADS, (ancient), Spearhead, pipestone $1.00; 4,000 *Bargains*. Beautiful Catalog (36 Photographs) 10c. Bannerstones, Pipes, Pendants, Tomahawks, Blunderbusses, Flintlocks, Antiques. Museum, Rutland, Illinois.

INDIAN relics, Confederate bills, coins, gems, minerals, curios, Catalog 52 illustrations 5c. 100 good ancient arrowheads $3.00. Tomahawk head 50c. H. Daniel, Hot Springs, Ark.

RARE COINS

COMMEMORATIVE Half Dollars, Lincoln, Stone Mountain, Oregon, Texas, Cleveland, Kentucky, San Diego, Long Island, $1.50 each. Illustrated Catalogue No. 14, 25c. Norman Schultz, Salt Lake, Utah.

FREE: Foreign Coin, Banknote and Large Illustrated coin catalogue, for 4c postage. Approvals sent. Tatham Coinco, Springfield-9, Mass.

INDIAN Relics. Dolls. Old Glass. Coins. Minerals. Opals. Catalogue 5c. Indian Museum, Northbranch, Kansas.

Build "Aquascooter"

[Continued from page 82]

and then rough it out with a draw knife or band saw. Use this piece as a pattern for the other pieces. Then lay out the curve as seen from the side and repeat the process. Make these curves as close as possible to the pattern of those in the drawing, but they do not have to be *identical*, and slight variation will do no harm. However, be sure that all four pieces match up. This also applies to the ends. Cut the rabbets on the curved bottom sides slightly over ¼-in. deep. Do your final smoothing up with the draw knife and sandpaper after assembly. Cut out the end pieces next, but do not cut the bottom rabbet until the joints are made and fitted. Then cut it to line up with the rabbets in the quarters.

Make the heavy centerboard trunk piece next. Join it to the front and rear transverse frames with 1x5½-in. mortise and tenon joints to distribute the strain of mast and centerboard. Bore six or seven ½-in. holes at one end of the centerboard slot and one at the other end and saw out the intervening material with a rip-saw. Bore the mast-hole with an expansion bit after you buy the mast, as you can't change the size of a bamboo mast. Rig up a jib for boring the mast hole to be sure you get the correct angle of rake. If you make a mistake, it can be rectified when the 1¾x5½-in. mast partner is placed.

The intermediate frames are mortised into both centerboard trunk and sides. The longitudinal members at front and rear are merely toe-nailed into place, after being tapered to the profile shape of the side pieces. Chamfer the top and bottom corners of frames at joints for limber holes to permit drainage.

To assemble, begin with the centerboard trunk. Then frames and sides. Set all joints liberally in casein glue. One galvanized nail down through each mortise and tenon joint is enough as the main strength of the assembly is in the covering. Fasten the quarters and ends with screws as shown. Use plenty of glue for real watertight joints.

The planking is ¼-in. plywood, preferably "resin-bonded" waterproof three-ply, laid in thick casein glue and fastened with copper shingle nails in 1/16-in. drilled holes not more than 2-in. on centers. To fit the plywood, place a small brad, point up, in each angle of the rabbet. Then, with one end of the plywood sheet on the center of the middle transverse frame, press the sheet down so that the brads stick in it. Lift it off and connect these brads with a straight-edge. Saw slightly outside these lines and plane down with a very sharp plane till the sheet just fits in the rabbet. Cut centerboard and mast holes in planking after fitting. Use plenty of glue and tack closely around the centerboard slot and mast hole.

The mast has no stays because they are too dangerous in case of capsizing, and are not necessary. One feature of this craft is that the entire rig can be set up or removed quickly and easily. Cut out the centerboard as shown. Bore a 3-in. hole in it, drive some brads radially around the inside edge of the hole, lay it on a level surface and pour it level full of molten lead. The centerboard is prevented from going down too far by the leading edge which rests against the fore end of the centerboard slot. It is pivoted through the mast partner by a ½-in. brass rod 6-in. long. The jib sheet fair-leads and the jib stay are ½-in. galvanized screw eyes set well in. Whittle the cleats out of wood, as metal cleats would be too sharp. Fasten the oar lock to the oar by closing the lock with a piece of heavy wire to which is attached a small pulley for the sheet. Wrap a piece of old leather strap around the oar above and below the oar lock to hold the oar in place. A big safety pin through the bottom of the oar lock will hold it in the socket.

A bamboo mast is preferable on account of its lightness and flexibility, but a good light piece of spruce tapered as shown will be nearly as good. If bamboo is used set it in the mast hole so that a joint rests on the mast partner and then cut off what projects below flush with the bottom. Put a neat fitting plug in the open end and paint it thoroughly so that it will not swell and split the bamboo. Put a plug in the end of the boom with a projecting end having a 2-in. notch in the end. Lash and glue a small wooden cleat on the boom 18-in. from this end. A ¼-in. rope is tied to the mast, put through this slot, and made fast to the cleat, drawing the sail smooth and taut. This is a "snotter" rig, and is necessary with such light sail and spars to hold the boom down.

Finish the entire hull with three coats of good spar varnish. No caulking should be necessary. Bore a 1-in. hole in each side piece for draining any possible leaks and plug these holes with tight fitting corks. The half-round gunwales are necessary to keep one from sliding off.

And now a word about sailing this craft. Don't try it in a surf the first time. Start in protected water. Put it on the sand at the waters edge. Set the sails at the angle you want them, according to course and wind. Pass the jib sheets through the screw-eyes and make fast around the cleats. Pass the main sheet through the pulley on the oar-lock and make fast to the cleat on the oar. Lift the stern by the hand grips so that the bow floats. Push it rapidly out, throwing yourself aboard over the windward side as the water becomes too deep to run, much as in launching one's self "bellywhopper" on a sled. Hold on to the end of the lee jib sheet with one hand and the oar with the other.

If you capsize, just swim around to the bottom, catch hold of the side which is floating high out of the water and pull it down. The mast goes up, you scramble aboard, and away you go again.

Navy Rushes New Air Base

[*Continued from page* 58]

will protect this stretch of coast and will be the second in the nation where plane carriers can come next to a dock. The other is at Norfolk, Virginia, on the East coast.

Of all the buildings to be erected at the Alameda base, the Navy sets most store upon the $1,000,000 assembly and repair shop. It will measure 400 by 700 feet and will be one of the largest and most efficient plane servicing plants in the world. Derricks will swing planes inside, to central bays, to be taken apart by mechanics. It will have separate engine and fuselage shops, and other subdivisions of the building will include instrument shops and a spray booth.

Working under wartime pressure, mechanics here will be able to keep almost 400 planes in service. The shop can handle 240 land planes, or the total complement of three carriers, plus two squadrons of seaplanes, at one time.

Commander Seibert has $5,800,000 to spend during the first two years. Congress must appropriate $5,000,000 for the third year and approximately $3,500,000 to wind up the job in the fourth year. Pumping and filling will take the largest single item of this expenditure, or $2,000,000. Other costs, shown by a partial cost list are: Land plane hangars, $1,400,000; seaplane hangars, $730,000; barracks and mess, $1,600,000; repair shop, $1,000,000.

Developing Cut Film

[*Continued from page* 105]

tank, approximately ½-in. apart, to hold the film hangers. The vest pocket size hangers are laid across the narrow width of the tank, while the 9x12cm., and 2½x3½ sizes are laid across the length.

For those using only one size film, it is a simple matter to alter the dimensions to suit the individual needs.

Once the film has been hung in the tank to develop, a light-tight cardboard box can be inverted over the tank and the rest of the developing carried out in full light. Be sure to turn out the light before transferring the film to the short stop bath.

Amber is not affected by moisture, a fact which makes it useful in apparatus for blood transfusions.

Vapors given off by Santa Maria Volcano, in Guatemala, contain hydrofluoric acid—an acid which dissolves glass.

A German printing firm is trying out type made from plastic instead of the customary lead and tin.

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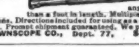

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Luminous Paint Used To Track Animals

Luminous paint was used successfully in keeping track of the movements of a small animal in the dark, by Dr. John H. Lochhead of Harvard University.

Just to make it harder, the animal in which Dr. Lochhead was interested was a water-inhabitant, a small brine shrimp. He laid out a specimen on a slip of glass, dried it carefully with filter paper, and applied the quick-drying luminous paint with a needle-tip. After giving it a few minutes to dry, the animal is carefully moistened and lowered into the water. Its movements after that can be traced as easily as those of a fire-balloon on Fourth of July night.

Application of the same technique to larger animals, and especially to terrestrial species and perhaps larger insects, should be much easier. Dr. Lochhead reports his new method in Science.

Glazes No Health Hazard

The use of colored glazes, containing lead, on chinaware is not necessarily a health hazard, according to a report by R. F. Geller and A. S. Creamer of the National Bureau of Standards.

Only one color gave any indication that it might be dangerous, while another might be if the glass were not properly treated during manufacture. Accelerated tests to simulate conditions such as might be imposed by putting fruit juices in the glass were used in the study.

Windmill Merry-Go-Chimes

[*Continued from page 102*]

All bearings are short lengths of brass tubing, reducing friction and wear, especially if given an occasional drop of oil. Make the windmill head as shown, with the fin fitting in a slot in the rear upright, and supports provided for a galvanized sheet roof. Note that the weight is carried on the rubber roller, hence it always has good traction. The vertical shaft on which the merry-go turns is carried in a countersunk steel plate, which when oiled will turn with slight force. Six animals are scroll-sawed from thin material (hard pressed board or plywood) and painted in bright colors. The apron conceals and protects a number of sheep bells (15c ea. at Sears), the clappers of which are tripped by an angle bracket. Select bells of different tones, and they will give out a chime tune.

Two two-by-fours, ends creosoted and set about 18 in. deep in the ground, form the frame. The windmill should be at least 8 ft. high in an open area, higher if necessary to rise about surrounding windbreaks.—*Hi Sibley.*

Use Waterproof Plywood

[*Continued from page 86*]

it should be possible to get a straight line somewhere along this surface.

For decks or hulls that are planked with plywood the frames should all be straight lines. The deck should be a straight line along its center and the beams all of the same radius. This often means the alteration of the sheer line at the sides to achieve this desired effect.

While there are many good waterproof plywoods on the market, if you are not sure of the plywood that you are purchasing, try the tests described in this article before you put a lot of labor in the job.

Weld wood, Haskelite, and Super Harboard can all be used with excellent results and are the plywoods most generally found around boat yards. While Presdwood is not strictly a plywood it is a very satisfactory composition that has been used successfully in boat building. Much heavier than the plywoods, it has specific gravities above one, which means that it is heavier than water and will sink. If this composition is used the tempered variety (sometimes known as masonite) should be selected. When used for decking, the rough side should be put on the walking side, as it is very smooth and slippery when finished with a gloss paint.

Trick Lighting Effects For Plays

[*Continued from page 97*]

slide a moving water effect is produced. When the fire disk is rotated in front of the flame slide the lines appear to rise and flicker very much like real flames. Various colored effects can be produced by the tint of the disks.

After the rain storm you may want to show heavy clouds moving across the cleared sky. In this case make some snapshots of clouds and print them on film stock to make positives. These should be 3¼ in. wide, (slide width). Cement these together in a long strip and black out all but the clouds themselves. Put a clear glass slide in the holder and then very carefully and slowly push the cloud strip along in front of the glass and your clear sky will take on the effect of a clearing storm.

The stage manager may be able to think of other "effect devices" once he has experimented with the foregoing. In all cases however, a mask must be used in front of the slide so the projected image will fall only upon that portion of the stage desired. This consists of an opening in black paper of the shape and size to prevent any of the projected image falling upon any undesired part of the scene. The idea is shown in the sketch. Some experimentation is necessary at rehearsals so the rainbow, clouds, etc., will only show in the "sky" of the scene and not upon the wings and other parts of the scene.

Swedish "Tinka" Box

[*Continued from page 99*]

Maple is a handsome wood for the purpose, but other wood that bends readily can be used. Spruce is good but does not have the beautiful grain of certain hardwoods. Cypress is another choice. To steam the pieces, which are only 3/16-in. thick, set them on bricks in a large washboiler, just above the water level, and steam for twenty minutes at least, then bend over the form and retain in place for several hours. For a natural finish, sandpaper and fill, and rub with steel wool between several coats of shellac, after each is thoroughly dry.

Decorative figures may be decalcomania, or designs suggestive of travel, such as the old-fashioned locomotive and sidewheeler done in oil paint.

The lid is of the same material as the sides, stiffened with the handle-piece across the top, one end of which is rabbeted to receive the sliding lock bar, as shown in the sectional drawing.—*Hi Sibley.*

Coins Of Adventure

[*Continued from page 98*]

remembered for many things, such as reduction of taxes, creation of charities for poor children, and adorning Rome with statues and architecture of worth. Today, as we look upon those Roman coins picturing Trajan, we reflect back to the Roman golden age with some wonderment. It was this ruler who, as a leader of his armies conquered Dacia, now Roumania, for the empire. Even today the Rumanians speak a language traced easily back to Trajan's time!

Thus the men and the women who have figured in the astonishing story of mankind, which we call history, are to be seen on coins; and the coin portraits are among the most accurate portrayals we have, since they are contemporary with the men and women shown. Which makes them valuable to us indeed, while pleasing the average collector as well.

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A new kind of paint made in Germany is said to be fireproofed by having nitrogen salts and synthetic resin mixed in it.

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A portable grease gun which may be rolled about at will and fits standard fittings. A motor and storage batteries mounted beside the grease tank on a coaster pump the grease electrically. Pressure may be adjusted up to 12,000 pounds.

An advertising blotter has a covering on the absorbent side which enables it to be addressed, stamped and mailed as a card. To use, the recipient peels off the cover, which leaves no trace of adhesive.

An electric water heater of low cost provides an automatic hot water supply for trailers, service stations, summer camps and the like. It has a two gallon capacity but will heat additional water rapidly. Piping is of the non-pressure type.

A newly designed sparkplug gives a more effective spark and has longer life. The center electrode is bent so the arc is from the side instead of from the tip.

A new pump for small drill deep wells. It operates in bores as small as three inches, heads up to 1,000 feet and capacities as low as five gallons a minute. The pumping unit, which is a helical rotor in a rubber fitting, delivers a smooth flow at low speeds and requires no priming.

A fan for ventilating houses has an automatic shutter. It opens when the fan is turned on, directs the flow of air and shuts noiselessly when the fan stops.

Roller bearings have an outside diameter the size of the barrel of an ordinary fountain pen.

Use of silos and a new preservative enables farmers to make hay while it rains.

A novel lure for fish looks like a fish swallowing a smaller fish.

One toothpick at a time is given out by this novel dispenser. The need for unsanitary trays is eliminated.

Long distance telephone talkers can cut their phone bills by this new wrinkle. It checks off the minutes as they pass, thus eliminating arguments with the operator.